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SOME NEW AUSTRALASIAN SPECIES OF XYRIS

by

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(Issued 18. XII. 1954).

During the study of the *Xyridaceae* of the Malaysian area it was desirable to study those of Australia and Continental Asia as well. The Malaysian species now have, in the meantime, been published (Flora Malesiana, ser. 1, 4, 1953, 366—376). To the new taxa described in Blumea 7, 1953, 307—308 the Latin diagnoses of the following new species and a new section may here be added:

1. Xyris linifolia van Royen, nov. spec. — *Fig. 1.*

Herba mediocris, ad 40 cm alta. *Folia* subulata, ad 25 cm longa, c. 1 cm diam., subfalcata, acuta, sparse papillata; vaginae 6—8 cm longae, basi 3—6 mm latae; ligula brevis acuta c. 1 mm longa. *Scapus* 20—40 cm, c. 1 mm diam., teretiusculus, 2- vel pluricostatus, minute papillatus. *Capitula* ovoidea ad globosa, pauciflora, ad 7 × 6 mm, bracteae basales suborbiculares, 4.5—5.5 × 3.5—4 mm, obtusae, enerves, in parte superiori minute papillatae, papillis arcum triangularem formantibus, medianae obovatae, 6—6.5 × 4.5—5 mm, nervosae, nervis nervo mediano et uno nervo completo in costae utroque latere orto ad bracteae apicem laxe reticulato compositis, in parte mediana superiori minute papillatae, papillis aream

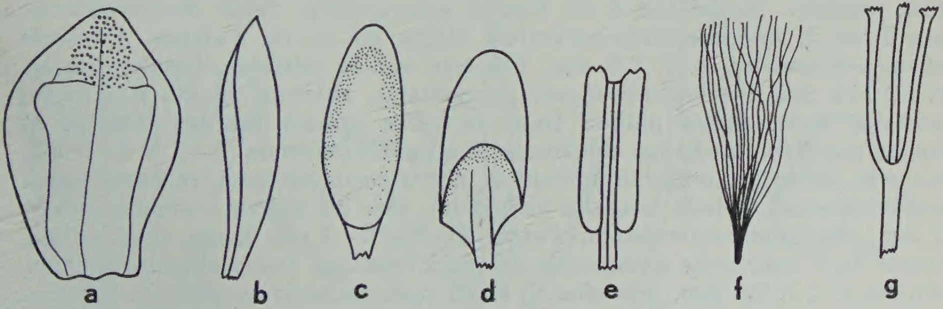

Fig. 1. — *Xyris linifolia* van Royen — a. median bract, b. lateral sepal, c. bud, d. median sepal, e. stamen, f. staminode, g. style (*Smiles s. n.*).

suborbicularem formantibus. *Flores* masculini ignoti, florum femineorum *sepala* lateralia angusta, 5.5—6.5 × c. 1.5 mm, acutiuscula, emarginata, ecristata, alata, alis sat latis, sepalum medianum cucullatum, 4.5—5 × c. 2 mm, binerve. *Petala* nondum evoluta limbo orbiculari 4 mm longo et lato munita, margine serrata, unguiculo c. 2 mm. *Stamina* c. 3 mm, antherae c. 2 mm, apice profunde emarginatae, basi apiceque obtusae thecis emarginatis. *Staminodia* 2.5—3 mm, penicillata bifida? Ovarium incomplete cognitum, stylus 4.5—5 mm (vel longior?), trifidus, ramificationibus c. 2.5 mm, apice capitatis. *Capsula* ignota.

Typus: *Smiles s. n.* in K.

Distr.: Siam — in open grassland near base of Mt Kau.

This species differs from all Malaysian species except *X. borneensis* in the terete leaves and the three complete nerves of the bracts.

Though the leaves of *X. borneensis* are also terete, the bracts are provided with numerous complete nerves. Moreover, the lateral sepals in *X. borneensis* are ciliate, those of *X. linifolia* smooth and entire. In its anthers the present species resembles *X. ridleyi, X. pauciflora, X. borneensis, X. capensis, X. complanata* etc., the anthers being deeply incised at the top and the thecae emarginate.

2. Xyris nigromucronata van Royen, nov. spec. — *Fig. 2.*

Herba annua parva, ad 6 cm alta. *Folia* linearia, 1—2.5 cm × c. 1 mm, mucronata, apice nigra et pilis robustis paucis hispida, anguste bi-alata, alis tenuiter et sparse papillatis, in parte basali elliptica in sectione transversa, apice incrassata et triangularia in sectione transversa, vaginae 3—6 cm longae, apice pilis multis albis munitae, margine membranacea, marginibus pedunculi basin includentibus, pedunculo ligula biloba pilis destituta praedito. *Scapus* ad 6 cm longus, subangularis, valde obscure alatus, alis 1 vel 2, proxime infra capitulum elatus ubi 3- vel 4-alatus. *Capitula* oblongo-ellipsoidea, c. 7 × 5 mm, bracteae omnes cristatae, basales ovatae, c. 6.5 × 3 mm, sat brunneo-nigrae, mucronatae, mucrone ad 2.5 mm longa, cristata, nigra, crista pallide flava in parte apicali tantum tenuiter et sparse papillata, medianae subcirculares ad panduriformes, 4—5 × 2—5 mm, margine sat brunneo-nigrae, uninerves, nervo completo laevi, in parte basali membranaceae. *Sepala* lateralia naviculata, fere ad apicem connata, c. 5 × 1 mm, membranacea ecristata. *Petala* 6, alba, 6—7 mm longa, unguiculata, ungui 4—5 mm, arcte cohaerentia et quasi tubulosa, limbo elliptico-oblongo, obtuso, c. 2 × 0.8 mm. *Stamina* 6, c. 1.2 mm, antheris ovoideis, c. 0.6 mm, truncatis, emarginatis thecae basi obtusae; filamenta subulata, c. 0.6 mm. *Staminodia* desunt. *Ovarium* subovoideum ad ellipsoideum, c. 2 × 1 mm, trilobum, in parte basali 3-, in parte superiori 1-loculare, stigmatibus 3 terminatum. *Capsula* ovario similis, sed ad 3 × 1.5 mm metiens; semina sparse papillatae.

Typus: *Pritzel 635 a* in L.

Distr.: Australia — in scrub between Moore and Murchinson river.

This specimen was found mixed with *Stylidium bulbiferum* Benth. var. *septentrionale* Mildbraed in *Pritzel 635*. Therefore it is separated from that species under *635 a.*

This highly characteristic species differs from all other species of

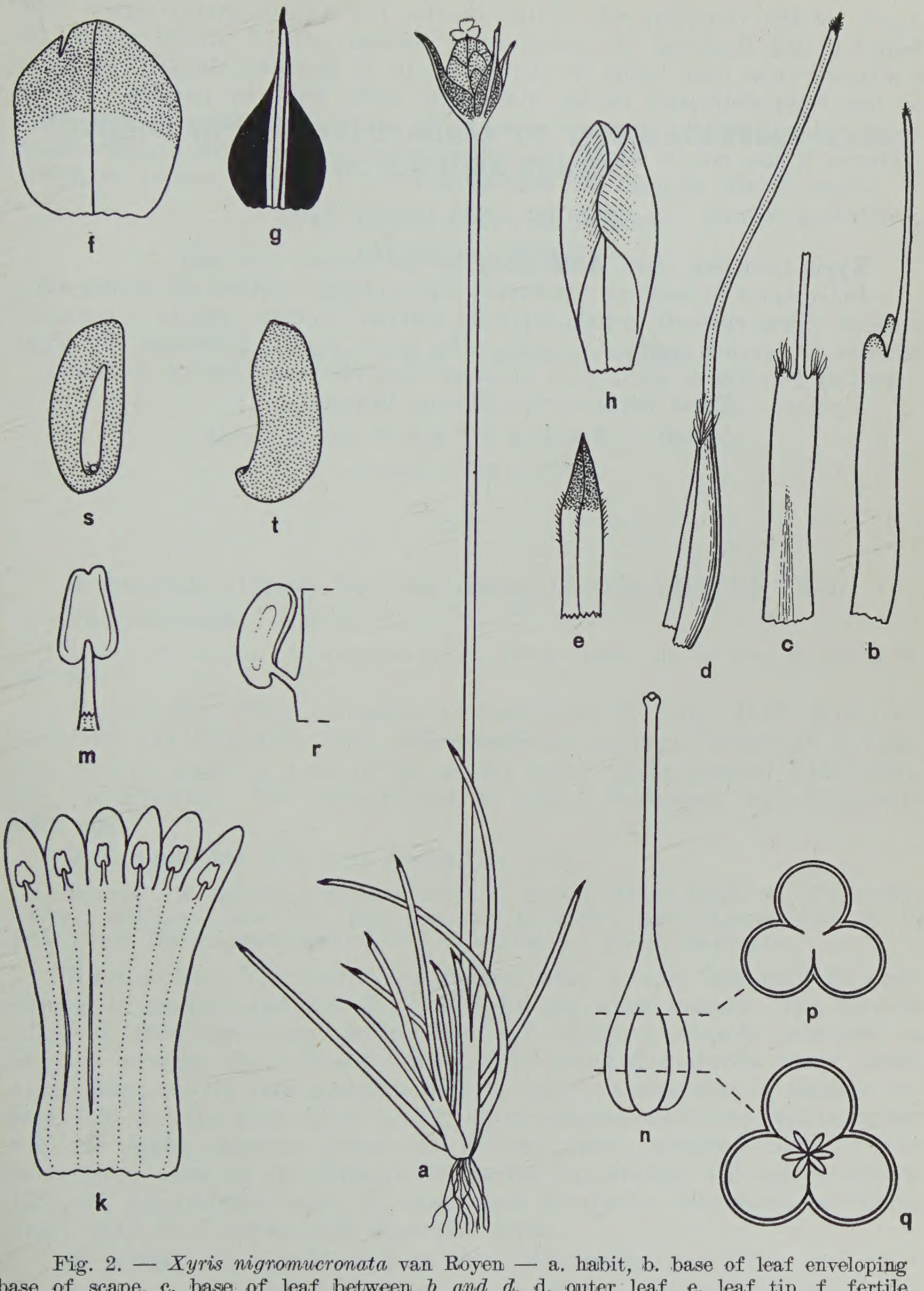

Fig. 2. — *Xyris nigromucronata* van Royen — a. habit, b. base of leaf enveloping base of scape, c. base of leaf between *b and d,* d. outer leaf, e. leaf tip, f. fertile bract, g. basal bract, h. lateral sepal, k. corolla, m. stamen, n. gynaecium, p. cross section of ovary in apical part, q. ditto in the middle, r. ovule, s. seed as seen from placenta, t. seed lateral (*Pritzel 635 a*).

Xyris by the fimbriate top of the sheath, the united lateral sepals (also found in the Brasilian *X. obtusiuscula* Nilsson), the 6 united petals, the 6 stamens (also once found by the author in *X. bancana* Miquel), the more or less campylotropous ovules, the entire style, and the papillate curved seeds. Moreover, the flowers seem to be white but owing to the dried material it can not be stated for certain whether this is the proper colour.

These details warrant the establishment of a separate section in *Xyris*, *Australoxyris* with the following Latin diagnosis:

Xyris Linnaeus, sect. **Australoxyris** van Royen, nov. sect.

Folia apice in sectione transversa triangularia, vaginae exteriores apice ciliatae, flores capitati; sepala lateralia maxime connata; petala 6, connata; stamina 6; stylus simplex; ovarium in parte basali 3-loculare, in parte superiori 1-loculare; ovula plus minusve campylotropa; semina papillata.

Typus: *Xyris nigromucronata* van Royen.

REVISION OF THE SAPOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

IVa. Ganua Pierre ex Dubard (Additional Notes)

by

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and

A. J. G. H. KOSTERMANS (Bogor)

(Issued 18. XII. 1954).

G. kingiana (Brace) Van den Assem, Blumea VII², 1953, 373.

Var. **kingiana,** l. c. 373.

MALAY PENINSULA. Singapore Isl., Bukit Timah: *Ridley 6294,* fl. and y. fr. (SING).

Remarks. This specimen has been cited by Lam (Bull. Jard. bot. Buit. Sér. III, VII, 1925, 160) under *Madhuca kingiana* (Brace) H. J. Lam. The remark made by Lam in his second paper (same journal VIII, 1927, 444) is incorrect. The indumentum, if any, is pubescent and disappears with age.

Var. **euphlebia** Van den Assem, l. c. 374.

BORNEO. N. Borneo, Elphinstone Prov., Tawao: *Elmer 21613,* fr. (NY, SING, SYSB); Sandakan, Kabili For. Res., 6 m alt.: *BNB For. Dept. (Agama) 4356* (K, L, SAN), flow. March, cream-coloured, tree 15 m; nat. n.: nyatoh, monongan.

Remarks. The fruits are globose when young, but tend to grow oblong or obovate and 2.3—2.7 × 1.3—1.6 cm when mature. The flowers (*B. N. B. 4356*) are large: pedicels 0.6—0.7 cm, stout, densely pubescent as is calyx outside; sepals broadly ovate, apex rounded, glabrous inside, about 1 cm long; corolla tube glabrous outside, hairy at insertion of stamens inside, 0.9—1.0 cm high, lobes ± 11, hairy outside, fimbriate, semicircular, 0.25 cm high; stamens about 23 in two rows, glabrous but for the protruding apex of the anthers, filaments 0.1, anthers 0.3 cm; pistillum 1.35 cm, appressedly hairy at base, style gradually contracted, glabrous, ovary with 6—7 ovules and imperfect septa.

G. pallida (Burck) H. J. Lam; Van den Assem l. c. 377.

BORNEO. E. Borneo, Loa Djanan, sandy loam soil ridge, 30 m alt.: *Kostermans 6677* (BO, L), old flow. Apr., tree 15 m (never more), bark dark brown, deeply fissured, reddish inside, as is wood; nat. n.: njato palong.

Remarks. The pedicels evidently elongate after flowering. In the above specimen they are up to 2.6 cm long. The branchlets are up to 1 cm in diam. and very rough by numerous scars. Leaves up to 22 × 5 cm.

G. motleyana (De Vriese) Pierre ex Dub.; Van den Assem l. c. 382.

Var. **motleyana** l. c. 382.

MALAY PENINSULA. Perak, Sg. Perak, kg Lambar Kiri, freshwater swamp: *Strugnell 57306*, ster. (KEP), tree 12 m high, important soft wood, nat. n.: bengku; Pahang, Kuala Terpai, Chenai Res., Rompin, in swamp: *Watson C. F. 3172*, ster. (KEP), tree with knee pneumatophores, latex white, nat. n.: ketior; Pekan, Ulu Bebar, in swamp on sea level: *Windsor 65669*, ster. (KEP), tree abt. 30 m high, girth 1.8 m, latex white. — Johore, Jemluang F. R. Comp. 17 E: *For. Res. Inst. Kepong (Sulong) 72909* (KEP), flow. Aug., greenish, tree 26 m.

BORNEO. N. Borneo, Kimanis For. Res., freshwater swamp forest, 3 m in alt.: *Mail bin Aliho A 3001*, flow. and fr. (SING), tree, 45 m high, 1.8 m in girth, flow. greenish, fr. green, oil from seeds for cooking, nat. n.: ketiau; Pertayo, Klias, freshwater swamp: *Apostol 22 (= Wood 2418, For. Dept.)*, ster. (SING), tree, 15 m high, 0.3 m in diam., nat. n.: ketiau; Elopura For. Distr., Kimanis, swamp, *BNB For. Dept. (Pingkan) 10153* (K, L, SAN), tree 21 m, nat. n.: ketiau; Sabah For. Distr., Lumat, 30 m alt., swampy, *BNB For. Dept. (Nail) 10313* (K, L, SAN), fr. in March, tree 6 m, edible oil fruit, nat. n.: ketiau; Sabah For. Distr., Sepalit, Bongawan, freshwater swamp: *BNB For. Dept. (Rahman) 10703* (K, L, SAN), fr. in Febr., tree 18 m, latex for chewing gum, nat. n.: ketiau; ibidem, swamp, 50 m alt.: *BNB For. Dept. (Rahman) 8873* (K, L, SAN), fr. in March, tree 18 m, flow. yellow, fr. green, latex for chewing gum, nat. n.: ketiau, flow. galls — Brunei, A.E.S., forest, 24 m alt.: *Keith 5921*, flow. (K, L, SAN, SING), tree 9 m high, 0.15 m in diam., edible oil nut, nat. n.: ketiau. — E. Borneo, West of Samarinda, Loa Haur, sandstone, low ridges, loam soil, 40 m alt.: *Kostermans 6787* (BO, L), tree 35 m, latex white, flow. white, in May, nat. n.: ŋjato hitam. — Sarawak, Mupong, *For. Dept. Sar. S. 0671* (SING), fr. Jan. 1954, large tree, white latex, bark with shallow fissuring, seeds collected by natives for fat.

G.? palembanica (Miq.) Van den Assem & Kostermans, nov. comb. — *Podocarpus palembanica* Miq., Fl. Ind. Bat. Suppl. 1860, p. 252, 589; Wasscher, Blumea 4, 1941, 471 sub spec. excl.

Type specimen and basonym: *Teysmann 3891* H. B., type of *Podocarpus palembanica* Miq.

Distribution: Sumatra, Borneo.

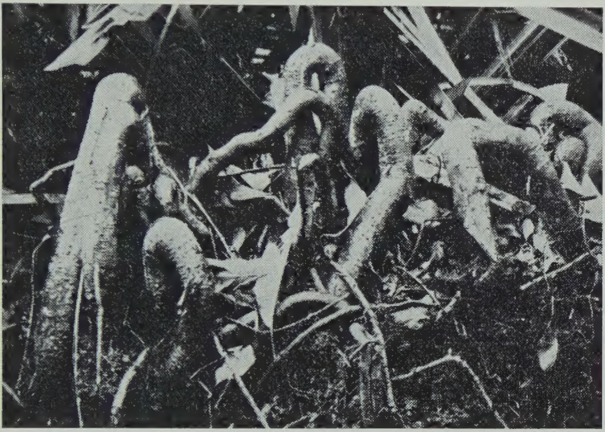
SUMATRA. Palembang, Muaradua: *Teysmann 3891 H.B.* (BO, U), ster., type of *Podocarpus palembanica* Miq.; Lematang Ilir, nr Tandjong, 95 m in alt., old forest, dry land: *FRI T.B. 644* (BO), ster., tree 24 m high, nat. n.: balem tekong (b. terong); Lematang ulu, nr Lubuk botong, fairly common in old forest on dry land, 400 m alt.: *FRI T.B. 657* (BO), ster., tree 20 m, latex little, white, fr. (not found in herb.) green, bitter.

BORNEO. S. E. Borneo, Puruktjahu, nr Biha, 90 m, fairly common in old forest on dry land: *FRI bb. 10600* (BO), ster., tree 31 m, latex little, white, nat. n.: puntik, or ŋjatu.

Remarks. In Reinwardtia II^2, 1953, 362, Kostermans suggests that the type specimen of *Podocarpus palembanica* Miq., viz. *Teijsmann 3891* (U), and some other specimens he is convinced to be conspecific with it, actually belong to the Sapotaceae, possibly to either *Ganua*, *Madhuca* or *Palaquium*. We checked up the type which is being preserved in Utrecht. The specimen is sterile and undoubtedly *no Podocarpus*. Its stipules (filiform and c. 0.8—1 cm long) and locally crowded (not whorled) glabrous leaves (acutely lanceolate, very long and narrow, 30 × 2 cm, petiole 1—1.5 cm) as well as the (faint) nervation render Kostermans's suggestion likely, but the specimen possibly represents a juvenile form.

This can, however, not be said of the other specimens which were kindly loaned to us by the Bogor Herbarium. In all of these the leaves are shorter and relatively broader than in the type but, on account of the similar stipules and venation type, they are most likely to be conspecific mutually and with *Teijsmann 3891.* Some particulars may follow here:

T. B. 644: leaves glabrous, lanceolate, small (6 × 1.4 cm, petiole 1.5 cm, abt. 15 secondary nerves) to rather large (17 × 3.7 cm, petiole 3 cm, abt. 20 sec. nerves), base decurrent, apex acutely or bluntly acute, stipules filiform 0.1 cm long.



Ganua motleyana — Loop-roots, 18″ high in freshwater swamp forest, Jurong, Singapore. Lenticels large, inner bark pink, latex white — Courtesy E. J. H. Corner.

T. B. 657: leaves as in preceding number, rather large, 8—19 × 2—3.9 cm, petioles 1.5—2.7 cm, secondary nerves 15—20.

FRI bb. 10600: leaves rather small and comparatively broad, abt. 10 × 1.5 cm, petiole abt. 2.5 cm, secondary nerves faint, abt. 15.

Our conclusion is that the specimens are undoubtedly sapotaceous and probably belong to *Ganua.* They cannot be combined, however, with one of the known species. This is why it was considered best to create a new combination.

FLORAE MALESIANAE PRECURSORES VII [1]
NEW MALAYSIAN FLACOURTIACEAE

by

H. SLEUMER

(Flora Malesiana, Leiden)

(Issued 18. XII. 1954).

Casearia amplectens Sleum. sp. nov. — *Arbuscula* 1.5 m alta; ramulorum apicibus dense breviter flavido-pilosis, partibus vetustioribus cito glabratis corticeque cinerascenti obtectis. *Folia* elliptico-oblonga vel oblonga, apicem versus breviter (1—2 cm) subcaudato-acuminata, apice ipso paullo falcato obtusa, basi late cuneata fere rotundata, inferiora usque ad 2 mm longe petiolata, superiora subsessilia, membranacea, arcte pellucido-punctata et -lineata, petiolo, costa nervisque subtus brevissime pilosulis exceptis glabra, in sicco brunnescentia, utrinque opaca, regulariter crenato-serrata (dentibus obtusiusculis glandula terminatis 1 mm altis et c. 3—6 mm distantibus), 9—15 cm longa, 4—4.5 cm lata, costa utrinque elevata, nervis lateralibus utroque latere 6—8 curvato-ascendentibus praeter marginem excurrentibus supra subimpressis, subtus elevatis, venis supra obscuris, subtus parum conspicuis. *Stipulae* reniformes fere amplectentes, membranaceae, 4—6 mm altae, 6—8 mm latae, persistentes. *Flores* pro axilla 1—2 fere sessiles, in statu nondum plane evoluto tantum visi; bracteae paucae membranaceae glabrae 1—2 mm longae. *Calyx* tubulosus, carnosulus, c. 3 mm longus, extus fulvo-sericeus, intus glaber, lobis oblongis c. 1 mm longis. *Stamina* 10, alte ad faucem inserta; filamenta glabra, medio dilatata, alternatim 0.6 et 0.3 mm longa. *Staminodia* rudimentaria parum pilosa. *Ovarium* columnare, glabrum, c. 3 mm longum, 1 mm crassum. *Fructus* carnosus, ruber, 1.5—2 cm longus, 1 cm diam., trivalvis, basi calycis lobis accrescentibus 4 mm longis et 1.5 mm latis fultus, 2 mm longe pedunculatus.

NEW GUINEA. W. New Guinea, 4 km SW of Bernhard Camp, Idenburg Riv., rain-forest undergrowth, 850 m: *L. J. Brass 13470* (A; L, *typus*), fl. fr. March 1939.

Casearia angiensis Sleum. sp. nov. — *Frutex* 3 m, ramulis ad apices subferrugineo-pilosis, nigrescentibus, obscure lenticellatis. *Folia* ovato-oblonga, apice breviter (1 cm) obtuse acuminata, basi late cuneata, vel interdum subrotundata, parum inaequilateralia, subcoriacea, in sicco viridescenti-olivacea, parum nitentia, supra glabra, subtus ad costam et nervos laterales laxissime, ad angulos costae cum nervis semper persistenter flavido- , vel subferrugineo-tomentosula ceterum glabra, valde manifeste pellucido-punctata et -striata, integra vel interdum apicem versus remote glandulis brevissimis denticulata, (5)7—9(10) cm longa, 2.5—4 cm lata, costa nervisque in sicco bene flavescentibus seu discoloribus supra parum vel vix elevatis, subtus prominentibus, nervis lateralibus curvatis utroque latere 4—5(6), venis manifeste transversis, cum venulis utrinque dense laeteque reticulato-prominulis; petiolus laxe adpresse pilosus 6—9 mm longus. *Flores* viridescentes, ad fasciculos paucifloros dispositi, eodem tempore flore unico evoluto (rarius floribus duobus evolutis); bracteae paucae minutissimae (0.5 mm) dense ferrugineo-pilosae; pedicelli sicut calyx breviter laxe adpresse ferrugineo-pilosi, c. 4—5 mm longi. *Calyx* 2.5 mm longus, fere usque ad basin 5-lobus. *Stamina* 10, 5 normalia filamentis filiformibus glabris 1 mm longis, 5 alia, ut videtur, haud bene evoluta, filamentis 0.5 mm longis. *Staminodia* 10, filiformia, imprimis apice pilosa, 0.5 mm longum. *Ovarium* ovoideum 3 mm longum, glabrum, stylo brevi. *Fructus* nondum plane maturus ellipsoideus c. 1.2 mm longus, glaber.

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[1] VI in Reinwardtia Vol. III.

NEW GUINEA. N.W. New Guinea, Manokwari Distr., Angi Gita Lake, in moist forest, 1800 m: *A. Kostermans 2116* (BO; L, *typus*), fl. fr. Oct. 1948.

Casearia archboldiana Sleum. sp. nov. — *Arbuscula* 3—8 m alta, ramulis juvenilibus in sicco nigrescentibus glaberrimis, in partibus vestustioribus laxe lenticellosis epidermideque dissoluto marmoratis. *Folia* elliptica vel subovato-elliptica, apice breviter (1—1.5 cm longe) obtuse subcaudato-acuminata, basi in petiolum attenuata, paullo inaequilateralia, firmule subcoriacea, utrinque nitida, supra in sicco intense brunnea, subtus dilutiora, supra glabra, subtus ad angulos nervorum cum costa flavescenti-tomentosula ceterum glabra, juniora sat dense manifesteque pellucido-punctata haud -lineata, matura fere impunctata, integra, 4.5—7.5 cm longa, (2)2.5—3.5 cm lata, costa supra bene, subtus valde prominente, nervis lateralibus utroque latere 4—5 sursum ascendentibus margine obscure inter sese curvato-conjunctis, supra parum, subtus manifestius elevatis, venis ± transversis cum venulis utrinque sat dense laeteque reticulato-prominulis; .petiolus glaber 8—10 mm longus. *Fasciculi* pauciflori, floribus eodem tempore 1—2 tantum evolutis; bracteae minutae (0.5 mm), scariosae, dorso breviter pubescentes; pedicelli graciles, glabri, c. 4 mm longi. *Calyx* viridescens, c. 2 mm longus, profunde 5-lobus, lobis extus glabris intus papilloso-puberulis. *Stamina* 8 subaequalia; filamenta filiformia glabra 1 mm longa. *Staminodia* clavata, 0.5 mm longa, dense hirsuta. *Ovarium* angustato-ovoideum, glabrum, 1.5 mm altum. *Fructus* ellipsoideus, ruber, 1.5—2 cm longus, c. 1 cm diam.; pedunculus 4 mm longus, 1 mm crassus.

NEW GUINEA. W. New Guinea, 15 km SW of Bernhard Camp, Idenburg Riv., mossy forest, 1800 m: *L. J. Brass 12098* (A, BO; L, *typus*); ibid.: *L. J. Brass 12171*; ibid., 1700 m, with long drooping branches: *L. J. Brass 12325*.

Casearia arfakensis Sleum. sp. nov. — *Frutex*, ut videtur; ramuli sat graciles teretiusculi, recentissimi dense minutissime pubescentes, cito glabrescentes et cinerascentes. *Folia* oblonga, apice breviter (1 cm) obtuse acuminata, basi in petiolum brevissimum (± 2 mm longum) attenuata, subsessilia, matura tenuiter chartacea, in sicco brunnea vel saturate olivacea, opaca, glabra, ± distincte striis pellucidis (haud vel parum punctis) obsita, integra usque remote glandulis minutissimis denticulata, 7—9(11) cm longa, 2—4 cm lata, costa supra fere plana subtus prominente, nervis lateralibus utroque latere 6—7, supra planis vel levissime immersis, subtus parum elevatis, venis transversis supra subobscuris, subtus parum elevatis. *Stipulae* triangulares vix 1—1.5 mm longae, plerumque caducae, interdum diutius persistentes. *Flores* singuli, in apice axis c. 3 mm longi multibracteolati sessiles; bracteae membranaceae, ovatae, subacutae, minute pubescentes, 1.5 mm longae. *Calyx* tubulosus, extus ± dense pubescens, intus glaber, 5 mm longus, in superiore media parte 5-lobus, lobis oblongis obtusis. *Stamina* 10; filamenta crasse filiformia, apice abrupte subulata, glabra, alternatim 1.2 et 0.9 mm longa. *Staminodia* inconspicua, pilos paucos tantum praebentia. *Ovarium* columnare, fere 5 mm longum, sat dense pilosum. *Fructus* haud visus, ex icone cl. coll. plantae originali affixo elongato-ellipticus, apice basique attenuatus, 4 cm longus, c. 1 cm crassus, seminibus paucis, arillo sanguineo circumdatis.

NEW GUINEA. N.W. New Guinea, Arfak Mts., near Putat: *O. Beccari, P. Papuan. 878* (FI, *typus*), fl. fr. Oct. 1872.

Casearia auriculata Sleum. sp. nov. — *Arbor*, ut videtur, parva, ramulis cinerascentibus teretibus etiam recentissimis glabris. *Folia* lanceolata, apice satis longe et obtuse acuminata, basi valde attenuata, sessilia, subcoriacea, obscure minuteque pellucido-punctata, utrinque glabra, in sicco nigrescentia et opaca, subintegra, 8—11 cm longa, 1.7—2.5(2.8) cm lata, costa utrinque elevata, nervis lateralibus utroque latere 5—6 supra obscuris vel levissime immersis, subtus parum prominentibus, venis subinconspicuis. *Stipulae* reniformes, ± amplectentes, persistentes, foliosae, 4—5 mm longae, 6—10 mm latae. *Flores* pro axilla 2—3, basi bracteis numerosis membranaceis glabris ovatis c. 1—2 mm longis circumdati; pedicelli crassiusculi breviter pubescentes 2 mm longi. *Calyx* tubulosus, 5 mm longus, extus breviter pubescens, in vivo carneus, lobis oblongis sub anthesi patentibus vel paullo recurvatis c. 1.6 mm longis, 1.2 mm latis. *Stamina* 10, filamentis glabris alternatim 0.5 et 0.3 mm longis. *Staminodia* brevissima pilosiuscula. *Ovarium* columnare, apice infra stigma capitatum paullo contractum, glabrum, 4 mm longum, 1 mm crassum. *Fructus* deest.

NEW GUINEA. N.W. New Guinea, Ramoi: *O. Beccari, P. Papuan. 333* (FI, *typus*).

Casearia brassii Sleum. sp. nov. — *Arbor* 4 m alta; ramuli recentissimi nigrescentes sat dense breviter griseo-patentipilosuli. *Folia* lanceolata vel oblongo-lanceolata, apice gradatim subcaudato-acuminata, acumine c. 3 cm longo parum falcato subacuto, basi attenuata et acuta, chartacea, laxe manifeste pellucido-punctata et -striata, in sicco saturate castanea, supra parum nitentia, subtus opaca, integra vel leviter undulata, supra costa pilosula excepta glabra, subtus ad costam nervosque laterales sat dense patenter pilosa, in facie interdum laxe pilosula vel plerumque glabrescentia, 13—15 cm longa, 3.5—4.5 cm lata, costa supra per totam longitudinem paullo sed distincte immersa, subtus alte prominente, nervis utroque latere 8—9, inferioribus 3—4 suberectis, superioribus magis curvatis, omnibus marginem petentibus ibique obscure inter sese arcuato-conjunctis, supra planis vel obscure impressis, subtus prominentibus, venis transversalibus sat approximatis cum rete venularum supra parum, subtus distinctius prominulis; petiolus sat gracilis, patentipilosulus, in sicco nigrescens, c. 1 cm longus. *Flores* virides, ad fasciculos 4—6-floros dispositi; bracteae numerosae ovatae pilosulae, 1 mm longae, pulvinar semiglobosum 2—3 mm diam. formantibus; pedicelli graciles, pubescentes, ± 4 mm longi. *Calyx* 3 mm, extus adpresse pubescens, sat profunde 5—10-lobus. *Stamina* 10 (raro 12); filamenta crasse filiformia, glabra, alternatim 1.5 et 2 mm longa; antherae ovatae apiculatae. *Staminodia* filamentis similia, 1 mm longa, apice tantum barbata. *Ovarium* elongato-ovoideum, 3 mm longum, sursum ad stylum pilosum, basi glabrum. *Fructus* ignotus.

NEW GUINEA. Papua, W. Div., Upper Wassi Kussa Riv., left branch, in rain-forest fringing river: *L. J. Brass 8626* (A, *typus*; BO, L).

Casearia brideliifolia Sleum. sp. nov. — *Frutex* 2 m, ramulorum apicibus in sicco nigrescentibus glabris vel pilis solitariis brevissimis laxissime obsitis, partibus vetustioribus cinerascenti-corticatis. *Folia* elliptica vel oblongo-elliptica, late breviter acuminata, acumine ipso magis attenuato subacuto c. 1 cm longo, basi ± late in petiolum brevissimum crassum c. 2 mm longum glabrum attenuata, in sicco saturate brunnea, glabra, subcoriacea, juniora laxe usque subdense punctis minutis pellucidis striisque obsita, matura fere impunctata, utrinque opaca, (10)12—18 cm longa, (5)6—9 cm lata, integra vel leviter undulata, costa supra parum vel vix, subtus bene elevata, nervis lateralibus utroque latere c. 9 arcuatis marginem petentibus supra planis, subtus prominentibus, venis distanter transversis subtus tantum prominulis, venulis supra inconspicuis, subtus parum distinctis. *Fasciculi* 3—4-flori; pedicelli crassiusculi glabri 2 mm longi; bracteae paucae, ovatae, ciliatae, 1 mm longae. *Calyx* 2 mm, lobis extus intusque glabris. *Stamina* 10; filamenta filiformia glabra, alternatim 0.6 et 0.4 mm longa; antherae subglobosae 0.3 mm diam. *Staminodia* triangulari-oblonga, applanata, apice fimbriata, 0.5 mm longa. *Ovarium* ovoideum, glabrum, 1.5 mm altum, apice in stylum brevem sat distinctum attenuatum. *Fructus* ellipsoideus, immaturus tantum cognitus c. 6 mm diam., pedunculo 2—3 mm longo.

NEW GUINEA. N.W. New Guinea, Geelvink Bay, Sennen, 10 km inward Nabire, rain-forest, 400 m: *R. Kanehira & S. Hatusima 12512* (A, *typus*; BO), fl. fr. March 1940; Dalman, Nabire, in *Agathis* forest, rare, 400 m: *R. Kanehira & S. Hatusima 12272*, fr. March 1940.

Casearia carrii Sleum. sp. nov. — *Frutex* 3 m, ramulis subangulatis brevissime pubescentibus cito omnino glabrescentibus corticeque cinerascenti obtectis. *Folia* ovato-oblonga, apice breviter (1—1.5 cm) subcaudato-acuminata, apice ipso obtusa vel subacuta, basi in petiolum cuneata, glabra, sed ad costam nervosque subtus sparsissime pilosula, subcoriacea, laxissime obscure pellucido-punctata et -striata, in sicco (rubro-)brunnea, ± opaca, margine sinuato-serrata (dentibus 1—1.5 mm altis subregulariter 3—6 mm distantibus), 7—14(18) cm longa, 4—6(8) cm lata, costa supra leviter elevata, subtus bene prominente, nervis lateralibus 5—6 curvatis marginem petentibus, supra planis, subtus parum prominentibus, venis transversis supra subobscuris, subtus prominulis; petiolus 3—6 mm longus, glaber. *Flores* albidi, in apice axis crassiusculi c. 3 mm longi dense bracteati 1—2, sessiles; bracteae ovato-acutae, membranaceae, glabrae, 2 mm longae, 1.5 mm diam. *Calyx* 4 mm longus, tubulosus, superne ad lobos extus intusque breviter pubescens, ceterum glabrescens, lobis 5 c. 1.5 mm longis. *Stamina* 10; filamenta crasse filiformia, glabra, alternatim 1 et 0.7 mm longa. *Sta-*

minodia inconspicua. *Ovarium* elongatum, 3 mm longum, vix 1 mm crassum, ± dense pilosum. *Fructus* ignotus.

NEW GUINEA. Papua, Centr. Div., Isuarava, secondary forest, 4000 ft.: *C. E. Carr 15476* (A; BM, *typus*; K, L), fl. Feb. 1936; Rouna, forest on path to Rouna falls, c. 1100 ft.: *C. E. Carr 12462*, fl. May 1935.

Casearia erythrocarpa Sleum. sp. nov. — *Arbor* parva, 8 m alta; ramuli recentissimi teretiusculi, subpatenter fulvo-hirsutuli, cito glabrati. *Folia* elliptico-oblonga, apice breviter (1—1.5 cm) ± oblique obtuse subcuspidato-acuminata, basi late cuneata, membranacea, in sicco brunnea, opaca, subtus paullo pallidiora, supra sparse in facie, densius ad costam et nervos pilosula, subtus densius molliter pilosa, ad costam tomentosula, dense pellucido-punctata et -striata, 12—18 cm longa, 5—8 cm lata, margine sat regulariter subserrato-crenata (denticulis minutis prorsus versis vix 0.5 mm altis et 3—5 mm distantibus), costa supra fere plana, subtus arcte prominente, nervis lateralibus utroque latere (10)11—12(14), subarcuatis, margine obscure inter sese curvato-conjunctis, supra planis et in sicco saturate brunneis, subtus parum prominentibus, venis supra inconspicuis subtus vix elevatis sed visibilibus et ± transversis; petiolus 1.5—2.5 mm longus, c. 1.5 mm crassus, fulvo-tomentosus. *Stipulae* subulato-lanceolatae 6—8 mm longae, basi 2 mm latae, interdum in utroque latere dentibus 1—2 incisae, acutae, dense pilosae, persistentes. *Flores*, ut videtur, 1—2 pro axilla, basi bracteis membranaceis pluribus subglabris 1.5 mm longis fulti, in reliquiis fructibus adhaerentibus tantum visi. *Calyx* c. 2.5 mm longus, extus pilosus, intus glaber, in superiore media parte 5-lobus. *Stamina* 10; filamenta filiformia glabra 0.7 et 0.5 mm longa. *Staminodia* elongato-triangularia, apice barbata, 0.5 mm longa. *Ovarium* haud visum. *Fructus* oblongus, carnosus, ruber, trivalvis, glaber, c. 1.8 cm longus, c. 1 cm crassus; semina 8—10 saturate rubra, arillo membranaceo lacerato.

NEW GUINEA. Papua, West. Div., Fly riv., 528 mile camp, rain-forest undergrowth, 80 m: *L. J. Brass 6692* (A, *typus*; BRI, L), fr. May 1936.

Casearia kostermansii Sleum. sp. nov. — *Frutex* 3 m; ramuli recentissimi subdense brevissime pubescentes, cito glabrescentes et striati. *Folia* oblongo-ovata, apice sat abrupte breviter (1.5—2 cm) acute acuminata, basi late cuneata usque subrotundata, chartacea usque subcoriacea, dense punctis minutis pellucidis (nec lineis) obsita, in sicco brunnea et opaca, subtus paullo pallidiora, integra vel minutissime glanduloso-denticulata, novella supra ad costam pilosa ceterum glabra, subtus per faciem laxe, ad costam nervosque laterales densius adpresse breviter flavescenti-pilosa, matura supra omnino glabra, subtus ad costam, nervos et venas laxe adpresse pilosa ceterum glabra, 15—20 cm longa, (6)7—9(11) cm lata, costa valida supra fere plana, subtus valde prominente, nervis lateralibus utroque latere c. 7 arcuatis, praeter marginem excurrentibus, supra levissime impressis, subtus prominentibus, venis subdense transversis supra obscuris, subtus cum venulis reticulato-prominulis; petiolus pubescens, 1.5 mm crassus, 5—7 mm longus. *Glomeruli* ex axibus brevissimis pluribus dense aggregatis c. 1—1.5 mm longis dense bracteatis formati, multiflori; bracteae scariosae minutae (0.5 mm); pedicelli crassiusculi, glabri, 1.5—2 mm longi. *Calyx* flavido-viridis, glaber, fere 4 mm longus, in superiore $^2/_3$ parte 5-lobus. *Stamina* 10; filamenta crasse filiformia glabra, alternatim 0.6 et 0.3 mm longa;

antherae 0.5 mm diam. *Staminodia* brevissima (0.2 mm), dense et satis longe albido-hirsuta. *Ovarium* anguste ovoideo-conicum, c. stylo 2 mm longum, dense longepilosum, stigmate crasso elongato sessili fere 1 mm longo. *Fructus* immaturus tantum cognitus, imprimis apicem versus laxe pilosus; pedunculus crassus 2 mm longus.

BORNEO. S.E. Borneo, Sampit Distr., Sg. Panjakuan (N. of Sampit), dry land, 10 m: *A. Kostermans 4722* (BO, *typus*; L), fl. March 1948; Sg. Wain region, N. of Balikpapan, low ridge, sandy loam soil, 40 m: *A. Kostermans 4330*, fr. Nov. 1950.

Casearia microcarpa Sleum. sp. nov. — *Frutex* 1—2.5 m, ramis divaricatis, ramulis recentissimis subteretibus ± dense breviter vel brevissime flavescenti-pilosis, cito glabrescentibus et longitudinaliter striatulis, griseo-corticatis, lenticellis oblongis sparsis. *Folia* elliptico-oblonga, apice breviter (1 cm) subacute acuminata, basi in petiolum attenuata, tenuiter chartacea usque membranacea, minutissime pellucido-punctulata vel impunctata, costa utrinque brevissime flavido-pilosa excepta glabra, in sicco brunnea et opaca, integra vel in foliis recentissimis minutissime remoteque serrata, (6)8—12(13) cm longa, 3—5(6) cm lata, costa supra parum elevata, subtus prominente, nervis lateralibus utroque latere 6—8 subarcuatis interque sese ± parallelis, nervis lateralibus intercalaribus nonnullis minus distinctis, omnibus supra ± impressis, subtus prominentibus, venis transversis supra obscuris, subtus parum elevatis; petiolus pubescens 2—5 mm longus. *Stipulae* subulatae, pubescentes, subpersistentes, 3—5 mm longi, basi c. 1 mm lati, cito firmulae usque subcoriaceae. *Glomeruli* 5—8-flori; bracteae minutae (0.5 mm), pubescentes; pedicelli graciles, glabri, ± 2 mm longi. *Calyx* tenuis, vix 2 mm longus, in $^2/_3$ sup. 5-lobus, glaber. *Stamina* 10; filamenta crassiuscule filiformia, (sub)glabra, alternatim 0.8 et 0.6 mm longa; antherae minutae, 0.25 mm diam. *Staminodia* obconica, 0.5 mm, apice tantum dense pilosa. *Ovarium* ovoideum, c. 1.5 mm longum, apice in stylum columnarem brevem abiens ibique laxe pilosum, basin versus glabrum. *Fructus* prob. immaturus, subglobosus, apice extremo excepto glaber, c. 8 mm diam.

NEW GUINEA. N.W. New Guinea, Geelvink Bay, Chaban, Nabire: *R. Kanehira & S. Hatusima 11858* (A, *typus*; BO), fr. Feb. 1940; Mc Cluer Gulf, Jakati near Babo, 50 m: *Aet* (Exp. *Lundquist*) *144*, fl. May 1941. N.E. New Guinea, Sepik Distr., August Riv.: *J. S. Womersley*, N.G.F. *3846*, fr. Sept. 1949.

To *C. microcarpa* probably also belongs the following collection:

S. New Guinea, Sg. Si-èra (Djèra) near Uta, 7 m: *Aet* (Exp. *Lundquist*) *269*, fr. June 1941.

Casearia monticola Sleum. sp. nov. — *Arbuscula* (6 m) vel frutex; ramuli novelli graciles nigricantes glaberrimi. *Folia* oblonga vel oblongo-lanceolata, apice breviter (0.5—1 cm) subcurvato-acuminata, apice extremo obtusiuscula, basi cuneata, aequilateralia vel interdum paullo inaequi-lateralia, tenuiter chartacea, in sicco saturate brunnea, opaca, integra vel undulato-crenata, glabra, interdum subtus costa laxissime pilis solitariis induta, obscure vel haud pellucido-punctata vel -lineata, 5—10 cm longa, (2)2.5—4(3.5) cm lata, costa supra vix elevata, subtus bene prominente, nervis lateralibus utroque latere 4—5 arcuato-ascendentibus, infimis e basi laminae ortis, supra fere planis subtus parum elevatis, venis venulisque sat dense reticulatis utrinque prominulis; petioli glabri nigrescentes ± 5 mm longi. *Glomeruli* summi parum conspicui, inferiores manifestiores et sub-globosi, 4 mm diam. attingentes, e ramulis vel axibus brevissimis compositi, multiflori; flores pallide virides; bracteae numerosissimae, minutae, 0.5 mm diam.; pedicelli graciles, laxissime pilosi, 4—5 mm longi. *Calyx* membranaceus, 2 mm longus, lobis extus intusque laxe brevissime adpresse subferrugineo-pilosis. *Stamina* 8 vel 10; filamenta teretiuscula circumpilosula, alternatim 0.9 et 0.6 mm longa; antherae subglobosae 0.3 mm diam. *Staminodia* clavata, dense subferrugineo-villosa, 0.4 mm longa. *Ovarium* elongato-ovoideum, sensim in stylum attenuatum, 1.5 mm longum, in inferiore parte pilosum, superne glabrum. *Fructus* deest.

NEW GUINEA. Papua, Centr. Div., Isuarava, forest, 4500 ft.: *C. E. Carr 15522* (A; BM, *typus*; L), fl. Feb. 1936; ibid., Boridi, forest, 5000 ft.: *C. E. Carr 13400*, fl. Sept. 1935.

Casearia olivacea Sleum. sp. nov. — *Arbor* 4—5 m, ramulis junioribus teretibus glabris, gracilibus, brunnescentibus. *Folia* ovato-oblonga, apice 1.5—2 cm longe subcaudato-acuminata, acuta, basi in petiolum brevissimum ± 2 mm longum attenuata, chartacea, olivacea, opaca, glaberrima, integra, (9)10—15 cm longa, 3—5 cm lata, densissime minute pellucido-punctulata, costa supra parum elevata, subtus prominente, nervis lateralibus utroque latere 5—6 valde arcuatis praeter marginem excurrentibus, superioribus 2—3 inter sese conjunctis, supra obscuris, subtus prominulis, venis distantibus ± transversis subtus tantum prominulis, reticulatione obscura. *Fasciculi* 4—6-flori; flores albidi; bracteae minutae (0.5 mm), dense albido-pubescentes, glomerulos parvos formantes; pedicelli laxe pilosi, ± 1.5 mm longi. *Calyx* laxe subadpresse pilosus, intus puberulus, 3 mm longus, profunde 5-lobus. *Stamina* 10; filamenta crasse filiformia, laxe brevissime circumpilosula, alternatim 1.1 et 0.8 mm longa; antherae subglobosae 0.4 mm diam. *Staminodia* 0.5 mm longa, albo-hirsuta. *Ovarium* anguste ovoideum, 2.5 mm altum, subdense pilosum, stylo brevissimo. *Fructus* ellipsoideus, subglaber, ruber, viridi-striatus, 3—3.5 cm longus, c. 2—3 cm diam.; pedunculus pubescens c. 4 mm longus.

NEW GUINEA. Papua, Western Div., Gaima, lower Fly Riv., east bank, common in rain-forest undergrowth: *L. J. Brass 8272*, fl. fr. Nov. 1936; Lake Daviumbu, Middle Fly Riv.: *L. J. Brass 7783* (A, *typus*; L), fl. Sept. 1936; Fly Riv., 528 mile camp, on low ridge, 80 m: *L. J. Brass 6814*, fr. May 1936; Palmer Riv. 2 miles below junction Black Riv., 100 m: *L. J. Brass 6931*, fr. June 1936; Fly Riv., *d'Albertis anno* 1877 (FI). Central Div., Sogeri region, *H. O. Forbes, Pl. Papuan. 415.*

Casearia oreogenes Sleum. sp. nov. — *Arbor* parva vel frutex, ramulis junioribus apicibus angulato-compressis, in sicco nigrescentibus minuteque pubescentibus, partibus vetustioribus teretibus glabris cito griseo-corticatis. *Folia* subovato-elliptico-oblonga, apice sensim breviter obtuse acuminata, basi latissime cuneata vel subtruncata, basi ipsa brevissime in petiolum protracta, subcoriacea, juniora ad costam laxe pilosula, matura omnino glabra, etiam matura manifeste sat dense pellucido-punctata et -striata, utrinque subnitida, in sicco saturate brunnea, integra vel remote subtiliter glanduloso- (interdum subsinuato-)denticulata, 15—20 cm longa, 6—9 cm lata, costa supra fere plana subtus valida et in sicco rubescente, nervis lateralibus utroque latere 10—11 parum curvatis marginem petentibus inter sese subparallelis, venis transversalibus supra vix, subtus manifestius prominulis ibique cum venulis sat dense reticulatis; petiolus sat crassus (± 1.5 mm), laxe pubescens, 4—7 mm longus. *Fasciculi* 3—4-flori; bracteae paucae ovatae pubescentes, vix 1 mm longae; pedicelli sicut calyx in sicco nigrescentes, crassiusculi, glabri, 2—3 mm longi. *Calyx* glaber, subcoriaceus, fere 5 mm longus, sat profunde 5-lobus, lobis acutiusculis intus laxissime brevissimeque pilosulis. *Stamina* 10; filamenta filiformia, glabra, alternatim 2 et 1.5 mm longa; antherae subglobosae 0.4 mm diam. *Staminodia* subdeltoideo-oblonga, applanata, dense albido-hirsuta, 1 mm longa. *Ovarium* ovoideum, sat dense pilosum, 2 mm altum, stigmate sessili. *Fructus*, ut videtur, fere maturus ellipsoideus, laxe pilosus vel glabrescens, ruber, c. 1.8 cm longus, 1.5 cm diam., pedunculo 3 mm longo.

New Guinea. N.E. New Guinea, Morobe Distr., Sattelberg to Wareo, hill woods, 2000—3000 ft.: *M. S. Clemens 1724* (L, *typus*), fl. fr. Feb. 1936.

Casearia papuana Sleum. sp. nov. — *Frutex* 1—1.5 m, ramulis gracilibus teretibus glabris, in sicco saturate brunneis. *Folia* ovato-lanceolata, apicem versus gradatim acuminata, apice ipso subfalcato obtusa vel acuta, basi late in petiolum cuneata, rigide merbranacea usque subcoriacea, impunctata, integra, glabra, subnitentia, in sicco (nigrescenti-)brunnea, 12—17 cm longa, (2.5)3—5 cm lata, costa supra fere plana, subtus bene prominente, nervis lateralibus utroque latere c. 7—8, inferioribus 4—5 praeter marginem excurrentibus, superioribus inter sese curvato-conjunctis, supra vix, subtus distincte elevatis, venis transversis supra parum conspicuis, subtus sat dense cum venulis reticulatis; petiolus glaber 3—4 mm longus. *Flores* albescenti-viridescentes ad summos axium brevissimorum (3—4 mm) dense bracteatorum 2—3, axibus ipsis plerumque solitariis; pedicelli 1.5 mm longi; bracteae scariosae minutae ovatae vix 0.5 mm longae. *Calyx* 2 mm longus, glaber, 2 mm longus, usque ad medium 5-lobus. *Stamina* 10; filamenta incrassata glabra, alternatim 0.9 et 0.6 mm longa. *Staminodia* inconspicua, ad pila nonnulla reducta. *Ovarium* elongato-ovoideum, pilosum, fere 2 mm longum, stigmate sat minuto capitellato. *Fructus* ellipsoideus ruber vel aurantiacus, 2 cm longus, 1 cm diam.

New Guinea. N.W. New Guinea, Nabire, Bivouac Prao, 30 km inward of Nabire, rain-forest, 100 m: *R. Kanehira & S. Hatusima 12795*, fl. March 1940; ibid., Dalman, in *Agathis* forest, 500 m: *R. Kanehira & S. Hatusima 12100*; ibid., Ayeryat, in fringing forest on rocky slope, 300 m: *R. Kanehira & S. Hatusima 12614* (BO, *typus*), fl. March 1940; ibid., rain-forest, 300 m: *R. Kanehira & S. Hatusima 12732*, fr. red.

Probably conspecific specimens with somewhat wider leaves from the Moluccas belong here:

Aru. Wokam: *O. Beccari* (coll. *4349, 4350*, FI), fl. fr. March 1873. Trangan (Lutor): *O. Beccari* (coll. *4351, 4351a*, FI); ibid.: *Treub* (BO), anno 1893; ibid.: *Buwalda 5388.*

Casearia rinoreoides Sleum. sp. nov. — *Frutex* 3 m altus, glaberrimus; ramuli recentissimi subangulati, demum teretes, in sicco flavescentes. *Folia* ovato-oblonga, apice breviter (1—1.5 cm) sensim subacute acuminata, basi in petiolum attenuata, subcoriacea, rigidula, in sicco flavida vel dilute olivacea, subtus opaca et pallidiora, margine subobscure remoteque crenato-serrata usque fere integra, 8—12 cm longa, 3—4.5 cm lata, costa supra parum, subtus bene prominente, nervis lateralibus marginem versus curvato-ascendentibus supra vix, subtus parum elevatis, venis ± transversis cum venulis utrinque rete sat densum distincte elevatum formantibus; petiolus c. 1 mm crassus, ± 1 cm longus. *Flores* sessiles, in statu juvenili tantum visi, solitarii vel 2—3-fasciculati, interdum in apice axis multibracteolati vix 1 mm longi dispositi; bracteae membranaceae ovatae subacutae glabrae 1.2 mm diam. *Calyx* glaber, carnosulus, 2 mm longus, profunde 5-lobus. *Stamina* 10 aequilonga; filamenta glabra, 0.5 mm longa. *Staminodia* brevissima parce pilosa. *Ovarium* crasse ovoideum, pilosum. *Fructus* ellipsoideus, c. 1.8 cm longus, 1.2 cm diam., aurantiacus.

NEW GUINEA. N.W. New Guinea, Geelvink Bay, Paterna, 40 km inward of Nabire, rare, 300 m: *R. Kanehira & S. Hatusima 11955* (A, *typus*; BO), fl. fr. Feb. 1940.

Casearia ripicola Sleum. sp. nov. — *Arbor* 6—15 m alta, innovationibus ferrugineo-tomentosis, ramulis cito glabratis teretiusculis, in sicco rubrobrunneis longitudinaliter striatis denseque lenticellis oblongis albescentibus obtectis. *Folia* elliptica usque oblongo-elliptica rarius oblonga, apice late acuminata atque in acumen obtusum vel subacutum brevem (0.5—1 cm) contracta, basi cuneata usque (sub)rotundata, integra vel venulis (glandulis) ultra marginem laminae prorumpentibus distanter minutissime denticulata, in sicco saturate fuscescenti-brunnea, subtus paullo pallidiora, chartacea, crebre, sed interdum haud bene visibiliter pellucido-punctata haud -lineata, supra subnitida et costa nervisque lateralibus exceptis glabra, subtus initio per faciem, imprimis ad costam et nervos tomentosula, maturitate glabrescentia sed ad costam et nervos et angulos nervorum cum costa diutius pilosa, (6)8—13(15) cm longa, (3)4—6.5 cm lata, costa supra leviter impressa, subtus crasse prominente, nervis lateralibus utroque latere 8—9 curvatis plerumque angulo fere recto a costa abeuntibus arcte inter sese parallelis supra planis vel levissime immersis, subtus prominentibus, venis venulisque utrinque rete sat densum parum sed visibiliter elevatum formantibus; petiolus breviter rufo-pilosus, ± 5 mm longus. *Flores* ad fasciculos paucifloros vel multifloros dispositi, albescenti-virescentes vel flavidi; bracteae numerosae 1 mm longae; pedicelli sat graciles, sub anthesi 8—14 mm longae, sicut bracteae et calyx fusco-ferrugineo-pubescentes. *Calyx* 3 mm, fere usque ad basin 5-lobus, lobis elliptico-oblongis obtusis intus pilosulis. *Stamina* 10; filamenta crasse filiformia, pilosula, alternatim 2 et 1.7 mm longa. *Staminodia* filamentis similia, sed apice barbellata, 1 mm longa. *Ovarium* ovoideum, 1.5 mm longum, albido-pilosum, apice in styli columnam fere glabram 1 mm longam contractum. *Fructus* ellipsoideus, aurantiaco-flavidus, maturus 2.5 cm longus, c. 1.5 cm crassus, laxe pilosus.

NEW GUINEA. N.W. New Guinea, Bele Riv., 18 km N.E. of Habbema Lake, 2200 m camp, common in second growth rain-forest: *L. J. Brass 11356*, fl. Nov. 1938; ibid., undergrowth of local flood plain forest: *L. J. Brass 11544* (A, BO; L, *typus*), fl. fr. Nov. 1938; ibid., 9 km N.E. Habbema Lake, second growth forest on moist soil, 2700 m: *L. J. Brass 10825*, fl. Nov. 1938.

A glabrescent, but apparently conspecific form:

NEW GUINEA. Papua, Centr. Div., Uniri Riv., c. 2150 m: *C. E. Carr 15188*, fl. Jan. 1936; Lala Riv., c. 1900 m: *C. E. Carr 14073*, fl. Dec. 1935; below the Gap, 2150 m: *C. E. Carr 15013*, fl. Jan. 1936; Mt Tafa, 2400 m: *L. J. Brass 4911*, fl. white May—Sept. 1933.

Casearia yatesii Sleum. sp. nov. — *Frutex* vel *arbor* ? *Ramuli* omnino glabri, in partibus vetustioribus teretibus tenuiter griseo-corticati. *Folia* oblonga, breviter sensim obtuse acuminata, basi late cuneata usque subrotundata, subcoriacea vel firmule chartacea, in sicco dilutius castanea et subnitida, subtus paullo pallidiora, glabra, sat dense manifeste pellucido-punctata et -striata, regulariter per totam marginem subserrato-dentata (dentibus glandulosis prorsus versis 0.5—1 mm altis, 4—5 mm distantibus), 10—17 cm longa, 5—7 cm lata, costa nervisque lateralibus supra planis vel paullo impressis, subtus valde prominentibus, nervis lateralibus utroque latere (8)9—10 curvato-ascendentibus, venis ± transversis cum venulis reticulatis supra parum, subtus distincte prominulis; petiolus rugosulus, glaber, c. 1.5 cm longus. *Flores* in glomerulis multifloris ad nodos ramulorum annotinorum defoliatorum dispositi; bracteae ovatae dense pilosae numerosissimae c. 0.5 mm diam., pulvinar ± semiglobosum formantes; pedicelli graciles glabri 6—8 mm longi. *Calyx* tenuis, 4 mm longus, profunde 5-lobus, glaber, haud reflexus. *Stamina* 10 aequalia; filamenta crasse filiformia, glabra, 3.5 mm longa; antherae subcordatae 0.7 mm longae. *Staminodia* rectangulari-clavata, crassa, dense hirsuta, 1.8 mm longa. *Ovarium* anguste ovoideum, 4 mm longum, apice sensim in stylum crassum attenuatum, ± dense pilosum. *Fructus* ignotus.

SUMATRA. Eastcoast, Asahan, Gurach Batu: *H. S. Yates 2116* (BO, *typus*; L). Probably conspecific: Atjeh, Pulu Beras near Kotaradja, 40 m: *Koorders 10607 β* (BO).

Flacourtia inermis Roxb. var. **moluccana** Sleum. var. nov. — A typo foliis minoribus 5—8(11) cm longis, 3—4(5) cm latis basi truncato-rotundatis recedit.

MOLUCCAS. Halmaheira, S. Peninsula, Tilope: *Anang* (Exp. *de Haan*) *574* (L, *typus*), fr. Apr. 1938; Weda Distr., coralline limestone in virgin forest: *de Haan 1712*, shrubby tree, used for timber, fr. red Jan. 1949, "*halimaditoko*" (Tobelo). Morotai, W. slope G. Sabatai, primary forest, small shrub, 150 m: *H. J. Lam 3568*, fr. green. Morotai, west coast, Guguti: *Anang* (Exp. *de Haan*) *215*.

NEW GUINEA. N.W. New Guinea, Mc Cluer, Anacasi by Babo, 50 m: *Aet* (Exp. *Lundquist*) *84*, fr. red. Wissel Lake region, Post to Bubeiro, biv. Prauw, Oderdo to Puro: *P. J. Eyma 5425*, a form with smaller leaves. Near Andai: *Teysmann*; ibid.; *O. Beccari 629*, anno 1872.

Flacourtia kinabaluensis Sleum. sp. nov. — *Arbor* gracilis vel frutex, prostratus; ramuli glabri cuprei opaci, apicibus vernicoso-nitidi. *Folia* oblongo-ovato usque lanceolato-ovata, subcaudata, apice ipso obtusa, basi rotundata, coriacea, glaberrima, utrinque nitida, costa nervisque lateralibus (6—8(9)-paribus) utrinque prominentibus, venis venulisque utrinque dense reticulatis et prominulis. *Racemi* axillares abbreviati, plerumque ad fasciculos 2—3-floros reducti; pedicelli laxe pilosuli 4—5 mm longi. *Calycis lobi* 4(5) ovati, obtusi, 2 mm longi, extus laxe, intus densius pilosuli. *Flores* ♂: *Stamina* c. 15, filamentis glabris 2 mm longis. *Disci lobi* truncati 8, carnosi. *Flores* ♀ adhuc incogniti. *Fructus* subglobosus 6—8 mm diam., ruber, basi sepalis persistentibus fultus, apice stylis 4 (5) centralibus brevibus (1 mm) ex summo apice radiatis instructus, semina 6—8 applanata continens.

BORNEO. Br. N. Borneo, Mt Kinabalu, Penibukan, 4—5000 ft.: *J. & M. S. Clemens 30949* (A, BO; L, *typus*), fr. Jan. 1933; ibid., Penibukan, jungle ridge above camp: *J. & M. S. Clemens 30886, 30956, 31378* (fl. ♂ cream), *31509*; ibid., Penataran basin, forest slope, 4—5000 ft.: *J. & M. S. Clemens 40164*.

Hydnocarpus pinguis Sleum. sp. nov. — "*Arbor* alta". *Ramuli* juniores omnino glabri, subangulati, in sicco nigrescentes, vetustiores teretes nigrescenti-brunnei. *Folia* elliptica vel oblongo-elliptica, ampla, apice breviter (1 cm) ± abtrupte acuminata interdum fere obtusa, basi rotundata vel latissime cuneata plerumque manifeste inaequilateralia, crasse coriacea, lucidula, glaberrima, integra, (11)13—18 cm longa, (5)7—10(12) cm lata, medio vel parum infra medium latissima, costa, nervis venisque in sicco rubescentibus, costa ipsa supra fere plana, subtus valde prominente, nervis lateralibus utroque latere 6—7-jugis infimis 2 quasi e laminae basi abeuntibus, minus distinctis, superioribus a costa angulo acuto (40°) superne magis curvatis praeter marginem excurrentibus ibique inter sese obscure conjunctis, supra elevatis sed subtus altius prominentibus, venis primariis ± irregulariter transversis, cum venulis rete subdensum utrinque laete elevatum formantibus; petiolus valde crassus (2—3 mm), 2.5—3.5 cm longus, glaberrimus, apice basique ± manifeste incrassatus lenticellisque pluribus subparallelis horizontalibus instructus. *Cymae* axillares, ut videtur, multiflorae, pedunculo crasso 5 mm longo, in specim. descr. floribus plurimis nondum evolutis bracteis involutis; pedicelli crassiusculi glabri circ. 2 mm longi. *Sepala* 4 chartacea subrotundata glabra, ad apicem tantum obscure fimbriata, 4—5 diam., nondum plane matura. *Petala* 8 subrotundata, carnosula, dorso densissime aureo-sericea, intus glabra, circ. 2.5 mm diam., nondum plane matura; squamae minutae. *Stamina* circ. 32, nondum bene evoluta, filamentis brevissimis (pilosis ?), antheris oblongo-cordatis.

BORNEO. Sarawak, Kuching: *O. Beccari 1191* (FI, *typus*); ibid.: *O. Beccari 1350, 2699.*

Hydnocarpus tenuipetala Sleum. sp. nov. — *Arbor* parva. *Ramuli* juniores subteretes cito cortice dilute brunneo obtecti, vetustiores cinerascentes. *Folia* elliptico-oblonga vel subovato-oblonga, apice abrupte breviter (1 cm) subacute acuminata, basi rotundata, aequilateralia, crasse coriacea, in sicco brunnea, subtus pallidiora, matura glabra (novella subtus ad costam et nervos laxe fusco-pilosula), integra, 11—14 cm longa, 4.5—6.5 cm lata, utrinque subnitida, costa nervisque supra parum, subtus valde prominentibus, nervis lateralibus utroque latere (4)5—6 subarcuatis praeter marginem excurrentibus, in sicco atro-nigrescentibus, venis distanter transversis, cum venulis sat laxe reticulatis et utrinque aequaliter bene prominulis; petiolus crassus (2 mm) rugosus supra caniculatus glaber 6—8 mm longus. *Cymae* axillares pauciflorae, pedunculo communi crasso rufo-puberulo circ. 3—5 mm longo; bracteae ovatae plures minutae; pedicelli subglabri 3 mm longi. *Sepala* 4 ovato-rotundata, concava, firmule membranacea, dorso brevissime laxissime pilosa, intus glabra, circ. 4 mm diam. *Petala* 8 tenera, late ovata, circ. 2.5 mm diam., glabra, apice erosa minuteque fimbriata, intus squama petala magnitudine fere aequante crassa dense hirsuta instructa. *Flores* ♂: *Stamina* circ. 14, filamentis gracilibus glabris basi infima dilatatis 2.5 mm longis, antheris cordatis 1.5 mm longis. *Ovarii rudimentum* hirsutum. *Flores* ♀ et fructus desunt.

BORNEO. Sarawak: *O. Beccari 2245* (FI, *typus*).

Pseudosmelia Sleum. gen. nov. — *Calycis lobi* (sepala) 4, imbricati, basi brevissime in tubum connati. *Flores* ♂ in statu juvenili tantum cogniti: *stamina*, ut videtur 8, alternatim longiora et breviora. *Staminodia* haud bene observata. *Rudimentum ovarii,* ut videtur, praesens. *Flores* ♀ in statu magis evoluto tantum cogniti: *stamina* 8 ut in *Osmelia. Staminodia* 4 episepala, squamam crasse carnosam subquadratam apice irregulariter erosam fere usque ad basin bifidam pubescentem praebentia. *Ovarium* fere cylindricum, sessile, pubescens, placentis 3 multiovulatis. *Styli* 3 divergentes; stigmata crassa biloba. *Capsula* fusiformis, brevissime pedunculata, stylis 3 brevibus crassis, stigmatibus sessilibus obscure bilobis, pericarpio coriaceo, basi sepalis 4 subpersistentibus fulta. *Semina* numerosa sat parva, testa laevi tenui, basi arillo membranaceo instructa; endospermium copiosum albuminoso-oleosum; cotyledones cordati foliacei seseque tegentes; embryo rectus; radicula crassa cylindrica.

Arbor dioica. *Folia* alterna, ± disticha, penninervia, petiolata. *Stipulae* subulatae ± caducae. *Inflorescentiae* axillares, subterminales vel caulinae, floribus subsessilibus laxe ad spicam elongatam dispositis, basi bractea bracteolisque duabus in cupulam connatis fultis.

Pseudosmelia moluccana Sleum. sp. nov. — *Arbor* parva 2.5—3 m alta, ramulis teretibus gracilibus initio laxe adpresse pilosis, cito glabrescentibus corticeque tenui griseo obtectis. *Folia* elliptico-oblonga, apice breviter (1—1.5 cm) cuspidato-caudata et falcata, subacuta, basi cuneata, tenuiter chartacea, in sicco sordide olivacea vel brunnescentia, subnitida, subtus pallidiora, subtus ad costam et nervos adpresse pilosula ceterum glabra, integra, 10—16 cm longa, 4—6.5 cm lata, costa supra leviter impressa, subtus bene prominente, nervis lateralibus curvato-ascendentibus utroque latere 7—8, infimis e basi orientibus, superioribus 3—4 tantum praeter marginem curvato-conjunctis, omnibus supra obscuris, subtus prominentibus, venis transversis cum venulis rete laxum utrinque elevatum formantibus; petioli graciles supra canaliculati, ± dense adpresse pilosuli, 6—10 mm longi. *Stipulae* subulatae pilosae 3—4 mm longae, pro parte maiore cito caducae. *Inflorescentiae* axillares vel subterminales vel caulinae, spiciformes, 15—20 cm longae; rhachis gracilis apicem versus sensim incrassata, ubique brevissime adpresse griseo-pilosa, vel glabrescens. *Flores* ♂ in alabastro tantum visi. *Flores* ♀ in statu progresso tantum cogniti: *sepala* 4 late ovata, concava, flavida, 2 mm longa. *Stamina* 8 haud exserta, antheris cordatis minutissimis polline carentibus; filamenta cylindracea satis crassa. *Staminodia* 2 mm longa. *Ovarium* cylindricum, in media parte subinflatum, pubescens, in statu evoluto 7 mm longum, 2 mm crassum. *Styli* 1 mm longi. *Infructescentiae* ad apicem tantum fructum unicum vel fructus 2 gerentes, ceterum vestigiis florum laxe instructae; pedunculi fructiferi 1—1.5 cm longi, c. 1 mm crassi. *Capsula* anguste fusiformis, in medio ± inflata, in sicco grisea, ± glabra, 5—9 cm longa, 1.2—2 cm crassa, apice breviter (c. 1 cm) attenuata, basin versus per 1.5 cm valde contracta quasi stipitata, apice in stylos 3 crassos 2—3 mm longos in sicco inflexos abiens, stigmatibus minutis crassis nigrescentibus. *Semina* 25—30, ± ovoidea, 4—5 mm longa, ± 3 mm crassa.

Moluccas. Morotai, G. Sangawo, common, 800 m: *A. Kostermans 1045* (L, *typus*), fr. May 1949. Morotai, W. slope of the G. Sabatai, in primary forest, 200 m: *H. J. Lam 3570* (BO), ♂ fl. in bud June 1926, "*mutinguti*" (Alf.). Halmaheira, Tasoa-Gn. Sembilan, common in thinned forest, 300 m: *D. R. Pleyte 239*, fl. ♀ and fr. 24. Sept. 1951.

Ryparosa baccaureoides Sleum. sp. nov. — *Arbor* parva, 3 m; ramuli subteretes, in sicco rubro-brunnei, adpresse ferrugineo-pubescentes tandem glabrescentes, lenticellis (elongato-)ellipticis sparsis. *Folia* elliptica vel ovato-elliptica, apice acute acuminata, basi late cuneata usque rotundata, subcoriacea, in sicco brunneo-olivacea, supra subnitida et glabra, subtus pallide olivacea et opaca, glabra vel plerumque ad nervos venasque pilis minutis pallidis obsita, (11)13—20(22) cm longa, (5)6—9(12) cm lata, costa supra leviter impressa subtus valde prominente, nervis lateralibus utroque latere 5—6 curvato-ascendentibus interque sese praeter marginem conjunctis supra fere planis, subtus prominentibus, venis imprimis subtus sat dense reticulato-elevatis; petiolus saturate ferrugineo-pubescens, serius glabrescens, longitudinaliter striatus, 2.5—4 (interdum usque ad 9) cm longus. *Inflorescentiae* ♂ et ♀ racemose spiciformes sat breves (8—12, raro usque ad 20 cm) e trunco ortae, interdum ♂ axillares; rhachis ± dense ferrugineo-pilosa; pedicelli 3 mm longi; bracteae minutae. *Calycis lobi* 3, ovati, extus ferrugineo-pilosi, intus fere glabri, c. 3 mm diam. *Petala* 5 oblonga, acuminata, ex coll. albida, extus griseo-sericea, intus subglabra, in sicco saturate rubra, 3 mm longa, 2 mm lata; squamae ovatae, crassae, dilute aureo-villosae, 2 mm diam. *Stamina* 5, filamentis in columnam glabram 4 mm longam connata. *Inflorescentiae* femininae caulinae tantum cognitae, solitariae vel 2—3 fasciculatae; rhachis satis crassa (2 mm), sub anthesi pendens, angulata, 20—30 cm longa, sat dense ferrugineo-pilosa; pedicelli 1.5 mm. *Calycis lobi* et *petala* quam in floribus ♂ paullo maiora. *Staminodia* 5, ad filamenta brevia reducta. *Ovarium* ovoideo-subglobosum, dense ferrugineo-hirsutum, stigmate sessili 3—4 (vel interdum 5)-lobato, lobis ipsis obovatis radiatis profunde impressis apiceque leviter bilobis. *Fructus* (fere maturus) trispermus depresso-globosus vel rotundato-trigonus, vel (seminibus 4) subquandangularis vel (seminibus 2) transverse oblongus, c. 1.5—2 cm altus, 2—2.5 cm crassus, brunneo-hirsutus et rugosus; pedunculus 2 mm crassus.

BORNEO. Br. N. Borneo, Mt Kinabalu, path to Ranau, 4800 ft.: *C. E. Carr, Sing. F. N. 26990* (SING, *typus*), ♂ & ♀ fl. Apr. 1933; ibid., Tenompok, 5000 ft.: *J. & M. S. Clemens 28109*, fr., *28109a*, fr., *28848*; ibid., Gurulau spur, 4500 ft.: *J. & M. S. Clemens 50502*; ibid., Dallas, 3000 ft.: *J. & M. S. Clemens 26597*; ibid., near Lodge: *J. & M. S. Clemens 29375.*

Ryparosa kostermansii Sleum. sp. nov. — *Arbor* 14—20 m, trunco tabulato 12—30 cm diam. *Folia* oblonga, apice sat abrupte acute acuminata (1—1.5 cm), basi cuneata, firmule chartacea, supra olivacea et glabra, subtus pallidiora, opaca, subtus per totam faciem sat dense pilis minutis pallidis appressis (sub lente tantum bene visibilibus) obtecta, (10)12—20 cm longa, (3)4—7 cm lata, integra, costa supra leviter immersa, subtus prominente pilisque brevibus substrigosis obsita, nervis lateralibus utroque latere 2 (rarissime 3, extremis subobscuris) erectis et elongatis supra parum, subtus bene prominentibus, venis ± obscure transversalibus, venulis utrinque distincte reticulatis sed parum elevatis; petiolus sat tenuis (1—1.5 mm), c. (1)1.2—1.8 cm longus, appresse sericeo-olivaceo-pilosus. *Inflorescentiae* adhuc incogniti. *Ovaria* evoluta et *fructus* immaturi pauci ad racemos axillares breves (5—9 cm) digesti; rhachis sat gracilis, 1.5 mm diam., dense pilis appressis olivaceis obtecta; pedicelli 1 mm diam.; fructus fere maturus depresso-globosus, in sicco saturate olivaceus brevissime tomentosus, ultro dense minuteque tuberculatus; stigmata 2 late reniformia, sessilia, in ovario approximata, in fructu immaturo (1.5 cm diam.) 1—2 mm distantia. *Semina* 1—2.

Borneo. S.E. Borneo, Peak of Balikpapan (G. Beratus), 640 m: *A. Kostermans 7564* (BO, *typus*; L), fr. immat. July 1952; ibid., on sandstone, 700 m: *A. Kostermans 7373*, fr. immat. July 1952; Sg. Wain region, N. of Balikpapan, low hills, 30 m: *A. Kostermans 4583*, sterile Nov. 1950; Martapura, Djungur, 350 m: *b.b. 10386*. W. Borneo, Melawi, 345 m: *b.b. 28347*; ibid., 375 m: *b.b. 26026*; Tajan, 100 m: *b.b. 14189*.

Probably conspecific specimen:

Borneo. Sarawak, Gunong Silang For. Res.: *Egon, For. Dep. A 917* (Herb. Kepong): *Fructus* depresso-globosus, 2.5—3 cm altus, 3.5—3.5 cm diam., minute tuberculatus punctisque albescentibus adspersus, semina 1—2 continens; pericarpium coriaceum 1 mm crassum; pedunculus 2—5 mm longus, 2—3 mm crassus.

REVISION OF THE BURSERACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

VIa, VII—IX [1]

by

C. KALKMAN

(Rijksherbarium, Leiden)

(Issued 18. XII. 1954).

Of this series of preparations to the definite publication of the Burseraceae in "Flora Malesiana", the present part is giving an additional note on VI. *Garuga* and dealing with the genera VII. *Triomma*, VIII. *Dacryodes* and IX. *Santiria* (and a new combination in *Protium*).

The present paper gives only additions to and alterations of Lam's monograph (H. J. Lam, Bull. Jard. Bot. Buitenz., Sér. 3, 12, 1932, 281—561); descriptions, synonyms, litterature, specimens cited, ecological and other notes are only mentioned insofar as they are not given by Lam.

Unless the presence of flowers or fruits is mentioned, the specimens cited are sterile; month of flowering and fruiting are designated by roman numerals.

At our disposal was material from the herbaria of Berlin, Bogor, Calcutta, Dehra Dun, Florence, Geneva, Honolulu (Bern. P. Bish. Mus.), Jamaica Plain (Arnold Arb.), Kepong, Kew, Leiden, London (Brit. Mus.), Paris, Singapore, Vienna, Washington (U.S. Nat. Herb.) and Zürich. The abbreviations of these herbaria are those proposed in "Index Herbariorum", 2nd ed. 1954.

It is our pleasant duty to tender our best thanks to the keepers of these institutions for their co-operative help.

VIa. **GARUGA** Roxb.

(Additional Note)

Cf. C. Kalkman in Blumea 7, 2, 1953, 459—472.

Note to p. 459.

After the above-quoted paper was printed, our attention was drawn to the fact that Adanson (Familles des Plantes 2, 1763, 510 & 534) has legalized the generic name *Katoukalesiam* (*Katou.Kalesiam* on p. 510), which is based on Van Rheede tot Draakenstein, Hort. Ind. Malabar. 4,

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[1] I—IV in Blumea 7, 1, 1952, 154—170, V and VI in Blumea 7, 2, 1953, 413—472.

1673, 69, t. 33, on which also *Garuga* Roxburgh has been based. It has been proposed to conserve *Garuga* Roxburgh over Adanson's name, which has never been used (cf. Taxon 3, 4, 1954, 124).

VII. TRIOMMA Hooker f.

Triomma Hooker f., Trans. Linn. Soc. 23, 1860, 171; Lam 1932b, 331. — *Monotypic genus.*

Triomma malaccensis Hooker f., l. c.; Lam 1932b, 332, fig. 8. — *Boswellia malaccensis* Marchand, Adansonia 8, 1867/68, 25.

Misc. inform.: Heyne 1950, 882 (sub nomine *Triomma macrocarpa* Backer); Hildebrand 1949a, b, c, d, e, f, h, 1952a, b, c, d, e; Webber 1941, 441—465.

Type specimen: *Maingay 299* in K, dupl. in L.

Distribution: Sumatra, Malay Peninsula, Bangka, Borneo.

SUMATRA. Eastcoast, Simelungun, Damakkitang: *NIFS bb. 33060* (BO, L); Riouw and Dependencies, Indragiri, Muara Serangge: *NIFS bb. 30065* (L), ♀ IX; Palembang, Lematang Ilir, Semangus: *NIFS bb. 31985* and *bb. 32157* (L); Lampong, Tarabangi: *Teysmann 4508* (L), fr., *isotype* of *Arytera? macrocarpa* Miq.

MALAY PENINSULA. Kedah, Guron, State Land: *unknown coll. 27479* (KEP), ♂ XI; Perak, Pondok Tanjong: *Godfrey 13217* (KEP); Behrang: *Abd. Rani 45552* (KEP); Selangor, Sungei Buloh: *Symington 44735* (KEP); Kuala Lumpur, Sungei Lalang: *Mohd Yattim 63547* and *66774* (KEP); Pahang, Bilut: *Sayid Ali 23445* (KEP); Putat: *Baba 31518* (KEP); Penting Batu (Anak Endau): *Said 31604* (KEP); Rompin, Mentas: *Debab 40155* (KEP), ♂ II; Negri Sembilan, Sungei Mengala: *Wyatt-Smith 64096* (KEP); Malacca, without loc.: *Alvins 1289* (SING), buds III; Singapore, Botanic Gardens Jungle: *Hassan 36278* (KEP), ♂ V; Bukit Timah: *Corner 34956* (KEP), ♂ IV; Malay Peninsula, without loc.: *Maingay 299* (L), fr., *isotype* of *Tr. malaccensis* Hk.f.; ibid.: *Maingay 354* (CAL), buds.

BANGKA. Lobok Besar: *NIFS bb. 34092 = Kostermans 158, Anta 837* and *Anta 880* (BO, L), ♂ IX; ibid.: *Anta 524* (BO, L), ♀ IX; ibid.: *NIFS bb. 33967 = Kostermans 29* and *NIFS bb. 34158 = Kostermans 224* (BO, L); ibid., G. Pading: *Anta 973* (BO, L), ♂ IX; Perlang: *NIFS bb. 34079 = Kostermans 145* (BO, L), ♂ IX; ibid.: *NIFS bb. 34113 = Kostermans 179* (BO, L).

BORNEO. West Borneo, Melawi, Tjatit, watershed Sungei Gantung and Badak Buruk: *NIFS bb. 31778* (L); British North Borneo, Sandakan, Elopura, Sepilok: *Kadir A 39* (KEP, L), ♂ IX: ibid., Kabili: *Kahar 48749 = S. H. 9962* (KEP, L), ♂ IX; ibid., Kretam: *Ping Sam S. H. A 1881* (L), ♂ V; Kinabatangan Besar, Kori: *Cuadra A 2124* (KEP, L); South and East Borneo, West Kutei, Selerong: *NIFS bb. 23993* (BO); ibid. (Teratak): *NIFS bb. 23995* (BO, L); ibid., Mendom (Atan Sungei Klindjan): *NIFS bb. 29252* (L); ibid., Djembajan (Sungei Kelesan): *NIFS bb. 25124* (L); ibid. (Sungei Djambu): *NIFS bb. 24678* (L); ibid., Tg Langkap: *NIFS bb. 23645* and *bb. 23992* (L); Pulu Laut & Tanah Bumbu, Saring: *NIFS bb. 27183* (L); ibid., Semblimbingan: *NIFS bb. 27189* and *bb. 31182* (L); Balikpapan, Sungei Tunan: *NIFS bb. 25633* (L); ibid., Sepaku: *NIFS bb. 24639* (L); Berau, Betemu air: *NIFS bb. 19135* and *bb. 19142* (BO, L); Pasir Sungei Ongka: *NIFS bb. 25595* (L); Loa Djanan, W. of Samarinda: *Kostermans 6580* (L), ♂ IV and *6598* (L), ♀ IV; Tdg Bangko, near Mahakam River estuary: *Kostermans 7104* (L), fr. V.

Remarks: Lofty trees, up to 45 m high, buttressed; bark scaling off, smooth or rough, greeny brown or greyish; resin little to abundant, colourless, white, light yellow or light red, combustible and with aromatic smell. *Habitat:* at low altitudes, rarely higher than 150 m alt. (210 m in Selangor, 260 m in Sum. Eastc., 285 m in W. Born., 300 m in S. & E. Born.). *Vernac. names:* assem (Sum., Lamp.), rengas, medang ampal, sudur bajan (Bangka), lamai (S. & E. Born.), binsian, bansision, terosob, maitus

(Br. N. Born.). *Flow. and fruit. times*: In Sum. fl. in VIII—XI (Riouw, Pal.), fr. in II—III (Pal.). In Mal. Penins. fl. in II (Pah.), IV—V (Sing., Negri Semb.), VIII (Selang.), XI (Kedah). In Bangka fl. in IX. In Born. fl. in IV—V (Br. N. Born., S. & E. Born.) and in IX—X (Br. N. Born., S. & E. Born.), fr. in V (S. & E. Born.).

VIII. DACRYODES Vahl

In 1932 Lam extended the genus *Pachylobus* Don in the sense of Engler (in Engler & Prantl, Nat. Pfl. fam., 2nd ed. 19a, 1931) with some 12 species from the genus *Santiria* (in the sense of Engler) and gave the resulting genus the correct name of *Dacryodes* Vahl (cf. Lam 1932b, 335).

Lam's subdivision of the genus is as follows:

Sectio I.	Archidacryodes H. J. Lam	— American species.
II.	Pachylobus Don	— African species
III.	Curtisina Ridley	— Asiatic species.

Some botanists reject the congenerity of the African and the Asiatic species (e.g. Exell & Mendonça in Consp. Florae Angol. 1, 2, 1951, 304) and maintain for the former a separate genus *Pachylobus* Don. Since, however, the characters of the fruits are of primary importance for the distinction of genera within the tribe *Canarieae*, I cannot see any justification for this separation, the fruits of both groups being identical; the differentiating features are: sepals free or slightly connate at base (Afr.), sepals connate (As., Am.), and: ovary 2(—3)-celled (Afr.), ovary 3—2-celled (Am.), ovary 3-celled (As.).

In my opinion, the subdivision of the genus — adapted to the present Code of Nomenclature — is as follows:

Dacryodes Vahl, Skrift. Dansk. Nat. hist. Selsk. 4, 1810, 116; Lam 1932b, 334—366; Lam 1938, 126—157 — Type species: *D. excelsa* Vahl, l.c. — Distribution: About 40 species in tropical regions.

Sectio DACRYODES — *Archidacryodes* H. J. Lam, 1932a, 202; Lam 1932b, 335 — Distribution: About 2 species in tropical America.

Sectio PACHYLOBUS (Don) H. J. Lam, 1932a, 202; Lam 1932b, 336; Don, Gen. Syst. Gard. & Bot. 2, 1832, 89 (as a genus) — Type species: *D. edulis* (Don) H. J. Lam, l. c. — Distribution: About 22 species in tropical Africa.

Sectio TENUIPYRENA Engler in DC, Mon. Phan. 4, 1883, 136 (as a section of *Canarium*, pro max. p.) — *Curtisina* Ridley, J. Roy. As. Soc. Str. Br. 82, 1920, 180 (as a genus); H. J. Lam 1932a, 202 and 1932b, 337 (as a section of *Dacryodes*) — Type species: *D. laxa* (Bennett) H. J. Lam — Distribution: 17 (prob. 18) species in Cochin China, Sumatra (1 end.), Malay Peninsula (4 end.), Riouw and Lingga Archipelago, Bangka, Billiton, Borneo (4 end.), Western Java, Philippines, Northern Celebes, New Guinea (1, prob. 2 end.).

This section is mainly restricted to the Sunda Shelf (*fig. 1*), but recently one, perhaps two species have become known from New Guinea. The genus can therefore also be expected to occur in the Moluccas.

Key to the species of the section Tenuipyrena

1a. No resiniferous ducts in medulla of branchlets, few or none in that of petioles 2

b. Some to many resiniferous ducts in medulla of branchlets and petioles . . 14

2a. Inflorescences terminal, sometimes with smaller additional axillary and/or lateral ones. No terminal vegetative bud extant 3

b. Inflorescences axillary or lateral. Terminal vegetative bud extant . . . 6

3a. Stamens inserted on or near rim of disc. 4

b. Stamens inserted outside disc 5

4a. Branchlets, petioles and inflorescences densely pilose or sometimes glabrous; inflorescences lax, up to 140 cm long; fruits 2.5—4.5 cm long, 0.8—2 cm in diam. — Petioles 1—14 cm long, 0.2—0.8 cm thick at base, flattened or channeled; leaflets oblong-lanceolate, 7.5—30 cm long, 2—9 cm wide, lowest pair often much smaller and falling earlier; secondary nerves 10—20(—24); flowers rather large, ca 0.4—0.6 cm long. — *Sumatra, Malay Peninsula, Borneo, Java?*

1. D. laxa (Bennett) H. J. Lam

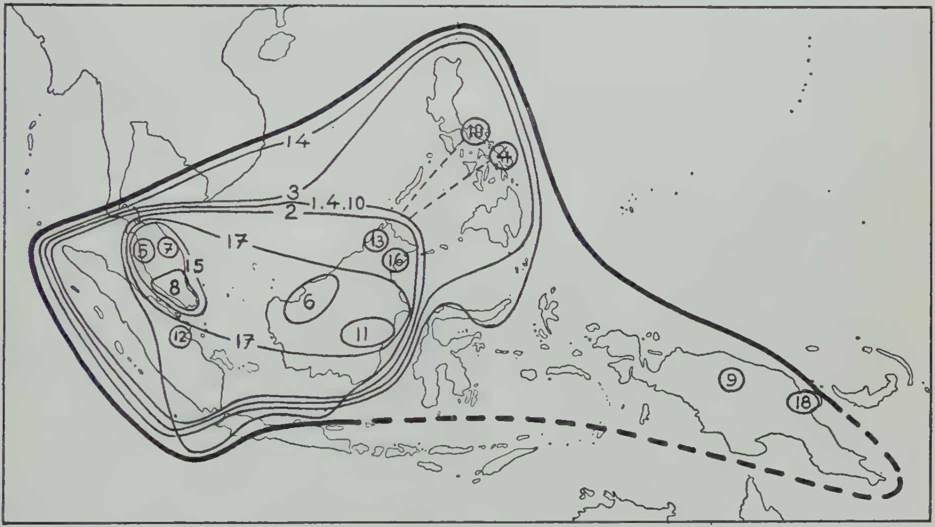

Fig. 1 — Distribution of the Malaysian species of *Dacryodes* — numbers refer to the number of the species in the present paper.

b. Branchlets and petioles pubescent, soon glabrescent; inflorescences 15—60 (♂) or 2—25 (♀) cm long, densely pubescent or (var. *virgata*) with erect hairs; fruits 1.4—2.6 cm long, 0.8—1.5 cm in diam. — Petioles (1.5—)3—9.5 cm long, 0.15—0.2 cm thick, round or more or less flattened at base; leaf rhachis swollen on nodes; leaflets variable in shape, elliptic, ovate or obovate to oblong or lanceolate, (3.8—)6—22(—24) cm long, (1.8—)2.5—11.3 cm wide; secondary nerves 7—12; inflorescences usually terminal on main or lateral branches, sometimes axillary or pseudoterminal (terminal bud extant); flowers 0.15—0.2 cm long. — *Sumatra, Malay Peninsula, Borneo, Java* **2. D. rugosa** (Blume) H. J. Lam

5a. Flowers relatively large, 0.2—0.25 (♂) or 0.3—0.35 (♀) cm long, cinnamon-brown when dry; pedicels i. s. angular, 0.05—0.1 cm thick; tertiary nerves reticulate. —Petioles (3.5—)4.5—8.5(—15.5) cm long; base of leaflets variable, usually rounded, sometimes subcordate or acute; ♂ inflorescences 3—17 cm, ♀ ones and infrutescences 8—21 cm long; petals tomentellous without, glabrous within; fruits 1.4—2.7 cm long, 0.8—1.7 cm in diam. — *Sumatra, Malay Peninsula, Borneo, Luzon, Mindanao* . . . . **3. D. incurvata** (Engler) H. J. Lam

b. Flowers smaller, 0.15—0.2 (♂) or 0.2—0.25 (♀) cm long, black brown when dry; pedicels terete, very thin, usually much less than 0.05 cm thick; tertiary nerves transverse. — Petioles 1—5(—6.5) cm long; base of leaflets acute, rarely subrounded; ♂ inflorescences 6.5—30 cm, ♀ ones (3—)8.5—20 cm, infrutescences (4—)8—18 cm long; petals glabrous; fruits (1.2—)1.4—1.9 cm long, 0.8—1.2 cm in diam. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Leyte* **4. D. costata** (Bennett) H. J. Lam

6a. Leaves 3½—15½-jugate; leaflets narrowly oblong, 3—6 times as long as wide, 6—30(—42) cm long, 2.5—8 cm wide; secondary nerves 8—14; ♂ flowers ca 0.35 cm long, stamens free around disc or slightly connate with its base; fruits 1.5—2.7 cm long, 1.2—1.5 cm in diam. — *Malay Peninsula* **5. D. longifolia** (King) H. J. Lam

b. Leaves ½—4½-jugate; leaflets up to 3 times as long as wide 7

7a. Petioles not flattened at base 8

b. Petioles more or less flattened at base 9

8a. Fruits 3.5 cm long, 3 cm in diam. — Branchlets and leaves glabrous; leaflets 17—29.5 cm long, 5—10 cm wide, brownish when dry, upper side with waxy appearance, reticulation lax and faint; ♂ inflorescences (5—)13—21 cm long, glabrous; ♂ flowers 0.5 cm long, stamens free from disc; infrutescences 27 cm long. — *Borneo* . . . . **6. D. expansa** (Ridley) H. J. Lam

b. Fruits 1.4—2.6 cm long, 0.8—1.5 cm in diam. — Branchlets and petioles pubescent, soon glabrescent; leaf rhachis swollen on nodes; leaflets (3.8—)6—22(—24) cm long, (1.8—)2.5—11.3 cm wide; inflorescences 15—60 cm (♂) or 2—25 cm (♀) long, densely pubescent or (var. *virgata*) with erect hairs; flowers 0.15—0.2 cm long, stamens inserted on or near rim of disc. — *Sumatra, Malay Peninsula, Borneo, Java* . . . . **2. D. rugosa** (Blume) H. J. Lam

9a. Fruits 1.4—2.6 cm long, 0.8—1.5 cm in diam. 10

b. Fruits 2.3—4 cm long, 1.3—2 cm in diam. 12
(Cf. also **18. Dacryodes?** spec. from *New Guinea*).

10a. Nervation inconspicuous at upper side of leaflets 11

b. Nervation conspicuous, though not prominent at upper side of leaflets. — Leaf rhachis not swollen on nodes, apex of leaflets gradually narrowed; inflorescences lateral on tips of branchlets; infrutescences 3—6 cm long; fruits 1.6—1.8 cm long, 0.9—1.1 cm in diam. — *Malay Peninsula* . . **7. D. breviracemosa** Kalkman

11a. Leaf rhachis swollen on nodes; apex of leaflets rather abruptly acuminate; inflorescences usually terminal on main or lateral branches, sometimes axillary or pseudoterminal (terminal bud extant). — Leaflets glabrous or somewhat appressedly pubescent underneath (var. *virgata* with erect hairs on midrib and secondary nerves of lower side); infrutescences 2—25 cm long; fruits 1.4—2.6 cm long, 0.8—1.5 cm in diam. — *Sumatra, Malay Peninsula, Borneo, Java* **2. D. rugosa** (Blume) H. J. Lam

b. Leaf rhachis not swollen on nodes, apex of leaflets gradually to subabruptly narrowed, base usually very oblique; inflorescences axillary (terminal bud extant). — Leaflets puberulous on nerves below, on upper side pubescent on base of midrib; infrutescences 3—5 cm long; fruits 1.5 cm long, 0.9—1 cm in diam. — *Malay Peninsula* . . . . **8. D. puberula** (Bennett) H. J. Lam

12a. Medulla of petioles without resiniferous ducts; leaflets shining, acuminate at apex, acumen 0.7—0.9 cm long; tertiary nerves laxely reticulate, not transverse. — Flowers unknown; infrutescences ca 12 cm long; fruits 2.7—3 cm long, ca 1.5 cm in diam. — *New Guinea* . . . . **9. D. papuana** Husson

b. Medulla of petioles with some resiniferous ducts; apex of leaflets rounded or only shortly and broadly acuminate; tertiary nerves transversely reticulate . 13

13a. Leaves and inflorescences glabrous; midrib and secondary nerves not very prominent below. — Inflorescences and infrutescences 6—25 cm long; petals thick, with inflexed margins and strongly inflexed apiculum (less distinct in var. *merrillii*); fruits 2.3—4 cm long, 1.3—2 cm in diam. — *Sumatra, Malay Peninsula, Lingga Archipelago, Borneo, Luzon* **10. D. macrocarpa** (King) H. J. Lam

b. Leaf-rhachis, petiolules and infrutescences puberulous to glabrous, as is midrib on lower side of leaflets; midrib and secondary nerves very prominent below. — Infrutescences 8—10 cm long; fruits 2.8—3.2 cm long, 1.6—2 cm in diam. — *Borneo* . . . . **11. D. kostermansii** Kalkman

14a. Branchlets, petioles and inflorescences densely pilose or sometimes glabrous; stamens inserted on or near rim of disc. — Petioles 1—14 cm long, 0.2—0.8 cm thick, flattened or channeled at base; leaflets 7.5—30 cm long, 2—9 cm wide, lowest pair often much smaller and falling earlier; flowers 0.4—0.6 cm long. — *Sumatra, Malay Peninsula, Borneo, Java?* . **1. D. laxa** (Bennett) H. J. Lam

b. Branchlets, petioles and inflorescences glabrous or tomentose; stamens free or slightly connate with disc 15
(Cf. also **12. D. crassipes** Kalkman from Sumatra)

15a. Disc pilose, with central channel. — Petioles not flattened, 6—7.5 cm long; leaflets ovate-oblong, glabrous above, minutely pulverulent below, 7—14 cm long, 2.5—6.5 cm wide; stamens inserted outside disc, connate at the very base; scandent (always?). — *Borneo* . . . . **13. D?. scandens** Husson

b. Disc glabrous; erect tree 16

16a. Inflorescences lateral, conferted at tips of branchlets. — Leaves glabrous or (forma *pubescens*) leaflets pubescent below; petioles round or somewhat flattened; leaflets variable in shape, (3—)5—20(—23) cm long, (1.5—)3—8(—12) cm wide, upper side with conspicuous reticulation; inflorescences (1.5—)5—30(—35) cm long; calyx lobes tomentose without, sericeously pubescent within; petals tomentose without; stamens inserted on outer side of disc; fruits 1.8—3.5(—4) cm long, 0.8—1.8(—2.2) cm in diam. — *Cochinchina, Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Palawan, Luzon, Samar, Leyte, Mindanao, N. Celebes*
14. D. rostrata (Blume) H. J. Lam

b. Inflorescences terminal, sometimes with additional, lateral or axillary ones . 17

17a. Petioles 19—21 cm long; secondary nerves 18—38. — Leaves 6½—8½-jugate; interjugae 8.5—12.5 cm long; leaflets oblong, 21—61 cm long, 5.5—13 cm wide; inflorescences lax, pendulous, up to 120 cm long; flowers glabrous, ♂ ones 0.3 cm, ♀ ones 0.5—0.6 cm long; fruits 2—2.7 cm long, 1—1.2 cm in diam. — *Malay Peninsula* . . . . **15. D. floribunda** (King) H. J. Lam

b. Petioles 1—14 cm long; secondary nerves 6—19 18

18a. Fruits 4—4.7 cm long, 2—2.4 cm in diam. — Petioles strongly flattened at base, 9—14.5 cm long, 0.7—0.8 cm thick at base; leaflets oblong, 12—22 cm long, 5—8.5 cm wide; secondary nerves 13—18; tertiary nerves transverse; infrutescences 17—45 cm long. — *Borneo* . . . . . **16. D. elmeri** H. J. Lam

b. Fruits 1.2—2.5 cm long, 0.8—1.7 cm in diam. 19

19a. Petals glabrous. — Petioles 1—5(—6.5) cm long; leaflets 3—14(—16) cm long, 1.3—6(—7.5) cm wide; inflorescences 6.5—30 cm (♂) or (3—)8.5—20 cm (♀) long; flowers 0.15—0.25 cm long, black brown when dry; fruits (1.2—)1.4—1.9 cm long, 0.8—1.2 cm in diam. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Leyte* . . . . **4. D. costata** (Bennett) H. J. Lam

b. Petals tomentellous without, glabrous within 20

20a. Leaflets glabrous; inflorescences and infrutescences minutely tomentose. — Petioles (3.5—)4.5—8.5(—15.5) cm long, 0.2—0.6 cm wide at base; leaflets ovate-elliptic to oblong or oblong-lanceolate, base usually rounded, sometimes subcordate or one half or both halves acute; secondary nerves (6—)8—18; ♂ inflorescences 3—17 cm, ♀ ones and infrutescences 8—21 cm long; fruits 1.4—2.7 cm long, 0.8—1.7 cm in diam. — *Sumatra, Malay Peninsula, Borneo, Luzon, Mindanao* . . . . **3. D. incurvata** (Engler) H. J. Lam

b. Lower side of leaflets densely pubescent on midrib and stronger secondary nerves; inflorescences and infrutescences with dense fur-like tomentum. — Petioles (2.4—)3—8.5 cm long, 0.2—0.3 cm thick at base; leaflets ovate, elliptic, obovate or oblong, (4.2—)6—16(—19.5) cm long, (2.2—)3.5—6(—7) cm wide, base acute to subrounded; secondary nerves (7—)10—13; ♂ inflorescences long and lax, up to 30 cm long (f. Lam); infrutescences 7—17 cm long; fruits ca 2 cm long, ca 1.2 cm in diam. — *Malay Peninsula, Borneo*
17. D. rubiginosa H. J. Lam

Incompletely known: **18. Dacryodes?** spec. (*New Guinea*)

1. D. laxa (Bennett) H. J. Lam, 1932a, 204 and 1932b, 355, fig. 15; Merrill 1934, 81.

Misc. inform.: Hildebrand 1949b, c, i; Husson & Lam 1952a, 166.

Type specimen and basonym: *Maingay 366* (K, dupl. in CAL, L), *type* of *Canarium laxum* Bennett in Hook., Fl. Brit. Ind. 1, 1875, 535.

Distribution: Sumatra (incl. Batu Isl.), Malay Peninsula, Borneo (Sarawak, Brunei, British North Borneo, one record from South and East Borneo), Java?

SUMATRA. Atjeh, Road from Kabandjahe to Katutjane: *Bangham 1096* (K, SING), buds II; Eastcoast, Semelungun, Tanah djawa, Pengkolan: *NIFS bb. 33061* (BO, L), fr. X; Palembang, R. Rawas: *Forbes 3070* (A), young fr., *isotype* of *Sant. forbesii* Bak. f., cf. Remarks.

MALAY PENINSULA. Kedah, Hulu Cherok, Peroh: *? Meh 17893* (KEP), fr. V; Bukit Bintang: *Sharin 35179* (KEP, L), ♂ III; P. Penang, Penang Hill: *Nauen 35842* (SING), fr. VII; Perak, Kinta: *D. F. O. 54812* and *54844* (KEP); Selangor, Sungei Buloh: *Ja'amat 14922* (KEP); Pahang, Ayer Hitam Kajang: *? Fyfe 26397* (KEP); Bilut: *Sayid Ali 23439* (KEP); Temerloh, Bukit Tok Morat: *Pawanchu 13755* (KEP), ♂ IX; Negri Sembilan, Mengala: *Wyatt-Smith 64060* (KEP, L), fr. VI; Johore, Sedili River below Mawai: *Corner s.n.* (SING); Singapore, Bukit Timah: *Ngadiman 37037* (SING), fr. VI; Tanglin: *Ridley s.n.* (W, nr 2873), fr.; Malay Peninsula, without loc.: *Maingay 366* (CAL, L), fr., *isotype* of *Can. laxum* Benn.

BORNEO. Sarawak, Kuching: *Beccari 390* (FI, P), ♂ and fr., *type* of *Can. fragile* Engl. in P., cf. Remarks; Brunei, Kampong: *Flemmich 34406* (KEP), ♂ III; Pak Gabal: *Flemmich 34510* (KEP), young fr. IV; British North Borneo, Tawau, Jelutong river: *Orolfo 4672* (L, SING), fr. V.

JAVA? no loc.: *de Vriese and Teysmann s.n.* (L, nr 908.205—570), cf. Remarks.

Remarks: This species is rather variable as to the length of the petiole and to the indumentum of rhachides, leaflets and inflorescences, but all my efforts to arrive at a reasonable subdivision of the species have failed. One could suggest to subdivide the specimens into two groups: a) with short petioles (1—3.5 cm) and b) with longer petioles (4.5—14 cm). However, *Orolfo 4672* (petioles 1.1—5 cm) is intermediate. In the Malay Peninsula only group a), in Borneo only group b) (except the above-mentioned *Orolfo*-number), in Sumatra both groups are represented, the only Java-specimen belonging to a). Though these groups partially correspond with Lam's varieties (*typica* and *forbesii* respectively), the feature does not correlate with any other (Lam mentions: indumentum and dimensions of fruits); consequently I do not favour a subdivision of this species.

The type specimen of *Santiria forbesii* Baker f. cannot represent a separate variety, *D. laxa* var. *forbesii* (Bak. f.) H. J. Lam, 1932a, 204 and 1932b, 357, as it is identical with the specific type.

The Java specimen (cited by Lam under *D. rugosa,* but on the sheet identified by him as *D. laxa*) is very doubtful: the annotations on *De Vriese and Teysmann* specimens are not always trustworthy as to the locality (island).

The type specimen of *Can. fragile* Engl. has 16—24 pairs of secondary nerves indeed and not — as Lam presumes, 1932b, 355, footnote — 24 in all. The description has therefore to be completed as to this point.

Small tree, usually not higher than 15 m, rarely up to 30 m; bark grey or pale green, scaling; fruits by one collector recorded as being edible, another collector says: sour, with strong smell. *Habitat*: Usually at lower altitudes, highest record 1200—1650 m (Atjeh); once collected in swampy habitat (Brunei). *Vernac. names*: andalhe batu (Sum., Eastc.), kelat hitam tarok (Mal. Penins., Pahang), telor merak (Mal. Penins., Kedah). *Flow. and fruit. time*: In Sum. fl. in II (buds, Atjeh), fr. in VIII—X (Benk., Batu Isl., Eastc.) and in I (Tapan.). In Malay Penins. fl. in III—IV

(Selang., Kedah, N. Semb.) and in IX (Selang.), fr. in V—VII (Selang., Kedah, N. Semb., Malacca, Singap., P. Penang) and in XI—XII (Selang.). In Borneo fl. in III (Brun.), VIII (Saraw.) and X (Br. N. Born.), fr. in IV—V (Brun., Br. N. Born.), VIII (Saraw., Br. N. Born.) and XII (Br. N. Born.).

2. D. rugosa (Blume) H. J. Lam, 1932a, 203 and 1932b, 345, fig. 12; Cretzoiu 1934, 265; Lam in Backer 1948, 3; Husson & Lam 1952a, 163—166.

Misc. inform.: Heyne 1950, 881; Hildebrand 1949a, b, c, f, h, 1950a, e, 1951d, 1952e; Pref. names 1952.

Type specimen and basonym: *Korthals s.n.* (L, nr 898.321—232), *type* of *Santiria rugosa* Blume, Mus. bot. Lugd.-Bat. 1, 14, 1850, 212.

Distribution: Sumatra (Southern part), Malay Peninsula, Borneo, West Java.

Remarks: Sterile specimens of this species are sometimes hardly distinguishable from *D. costata*. The petioles of *D. rugosa* are usually not so strongly flattened as those of *D. costata*; the leaf rhachis is much more distinctly swollen on the nodes in *D. rugosa*, which generally makes a more slender impression. *D. costata* has — generally spoken — shorter leaves, shorter and more slender petioles, interjugae and petiolules, and smaller leaflets. In some cases the identification of sterile specimens remains doubtful.

Small tree of 5—20 m, rarely higher, once reported as being a shrub of 6 m (*Cuadra A 1094*, Brit. N. Born.). No buttresses. Greenish, greyish or pale brown bark, smooth, flaking off, without or with little clear sap. Petioles light fawn brown (*Corner, Kostermans*), petiolules with large knobs at both ends (*Wyatt-Smith 64072*). Flowers pale yellow or white. Fruits reported in various shades between yellow and red. *Vernac. names*: kedondong (Mal. Penins.), patiu, tompulan, dayau, owas-owas, pitong kalaout, talang sai, paninasan burong (var. *rug.*, Br. N. Born.), kambayu burong (var. *virg.*, Br. N. Born.), watuk (S. & E. Born.). *Flow. and fruit. times*: In Mal. Penins. fl. in IX—XI (Kedah, Perak, Selang., Pahang), fr. in VII (Perak, Kelant.) and in X—I (Kedah, Perak, Pahang). In Born. fl. in XI (Brunei, S. & E. Born.), fr. in V—VII (Br. N. Born., S. & E. Born.) and in X—XII (Saraw., Br. N. Born.). In Java fl. in IX (buds)—XII.

Var. **rugosa** — *D. rugosa* (Blume) H. J. Lam var. *genuina* H. J. Lam, 1932a, 203 and 1932b, 347 — *D. rugosa* (Blume) H. J. Lam var. *moultonii* (Ridley) H. J. Lam, 1932a, 203 and 1932b, 348 — Leaflets glabrous or more or less appressedly pubescent underneath.

Distribution: as the species.

SUMATRA. Riouw and Dependencies, Indragiri, Muara Serangge: *NIFS bb. 30079* (L); Palembang, Lematang Ilir, Semangus: *NIFS bb. 31994* and *bb. 32018* (L).

MALAY PENINSULA. P. Penang, no loc.: *Curtis 1431* (BM), ♂, cf. Remarks; Perak, Trolak: *Browne 43487* (KEP); Salama: *King's coll. 3123* (US), detached fr. VII; Larut: *King's coll. 3716* (L), fr. I; Kelantan, S. Chalil, Sungai Lebir: *Henderson 29545* (BO), fr. VII; ibid.: *Browne 38489* (KEP); Selangor, Semangkok: *Wyatt-Smith 71377* (KEP); Pahang, Bukit Petai, Berjuntai: *Pawanchu 13783* (KEP), ♂ IX; Endau, Sungei Mentulang: *Debab 40157* (KEP); Kemaman, B. Kajang: *Corner s.n.* (SING); ibid.: *Corner s.n.* (SING), ♀ XI; Kemansul: *Symington 49829* (KEP), young fr. XI; N. Sembilan, Mengala: *Wyatt-Smith 64072* (KEP), fallen fls. VI; Malay Peninsula, without loc.: *Scortechini s.n.* (= *1988?*) (US), ♂ buds.

Borneo. Sarawak, Gunong Gading: *Daud & Tachun 36107* (KEP), ♂ buds IX; Kuching: *Beccari 738* (FI), fr. X; Brunei, Upper Baram, Gunong Simabok: *Moulton 6767* (BM), ♀ XI, *type* of *Canarium moultonii* Ridley; British North Borneo, Sandakan, Elopura, Kabili: *Kadir A 633* (KEP, SING), fr. XII; ibid.: *Puasa 4843* (L, SING), fr. VI; ibid.: *Keith 38901* (= *S. H. 4525*) (KEP, L, SING), fr. V; ibid., Sepilok: *Kadir A 545* (L, SING) and *A 575* (KEP, L, SING), fr. XI; ibid., Segalina: *Cuadra A 1094* (KEP, SING), fr. XI; Sapagaya: *Puasa 1447* (K), fr. VII; Tawau, Umas-umas: *Maidin 4895* (SING), young fr. V; no loc.: *Creagh s.n.* (L, nr 934.238—124), young fr.; South and East Borneo, West Kutai, Kahala: *NIFS bb. 28368* (BO); Tewe river: *Korthals s.n.* (L, nr 898.321—232), fr., *type* of *Sant. rugosa* Bl.; Loa Djanan near Samarinda: *Kostermans 6372* (L), ♂ IV; ibid.: *Kostermans 6402* (L), buds IV; ibid.: *Kostermans 6585* (L), young fr. IV; Tandjong Bangko region, near mouth of Mahakam River: *Kostermans 7016* (L), fr. V; East Kutai, Sungei Susuk: *Kostermans 5706* (L), buds VII.

Java. West Java, Bogor, Djasinga, Tjurug: *Esche & Wasynt Ja 6138* (L), buds IX.

Remarks: The differences between the type specimen of var. *moultonii* H. J. Lam and the specific type are so slight, that I cannot maintain the former as a separate variety.

From Java, only two specimens are known, both from Djasinga. *De Vriese & Teysmann s.n.*, cited by Lam, appeared to belong to *D. laxa* (cf. remarks to that species). According to Hildebrand 1951d, the species is very rare in West Java.

The British Museum specimen of *Curtis 1131* does not belong to *D. laxa* (Lam, 1932b, footnote p. 347); possibly there are different species gathered under one number.

Var. **virgata** (Blume) H. J. Lam, 1932a, 203 and 1932b, 348 — Lower side of leaflets with erect hairs on midrib and secondary nerves.

Type specimen and basonym: *Korthals s.n.* (L, nr 898.321—249), *type* of *Santiria virgata* Blume, l. c., 1850, 213.

Distribution: Borneo.

Borneo. West Borneo, G. Pamaton: *Korthals s.n.* (L, nr 898.321—249), ♂, *type* of *S. virgata* Bl.; Sarawak, Matang: *Ridley 12265* (BM, SING), ♂ VIII; ibid.: *Haviland c.r.m.d.* (SING), ♂; British North Borneo, Kabili-Sepilok: *Enggoh 41435* = *S. H. 7303* (KEP, L, SING), fr. VII; South and East Borneo, Tanahbumbu, Batulitjin: *Van Slooten 2118* (L), ♂ X.

Remarks: Comparing *D. scandens* with *D. rugosa* var. *virgata*, Husson & Lam 1952a, 166, say that "in neither there is a rudiment of an ovary" in the ♂ flower. This is not correct: among the five ♂ flowers of the latter, examined by me, there was only one without an ovarial rudiment in the flower, while in the others it ranged from rather small to very minute. The anatomy of the petioles is not essentially different either (as is suggested by Husson and Lam): in nine petioles out of seven different specimens of *D. rugosa* var. *virgata* I found the number of resiniferous bundles in the medulla ranging from 1 to 4. It is possible that in the type variety they are sometimes wanting, although I have not met with such a case.

3. **D. incurvata** (Engler) H. J. Lam, 1932a, 204 and 1932b, 362, fig. 19; Quisumbing 1944, 42 (sub nomine *Hemisantiria nitida* [Merr.] H. J. Lam). — *D. angulata* (Ridley) H. J. Lam, 1932a, 204 and 1932b, 364, fig. 20.

Misc. inform.: Hildebrand 1949a, f, h, 1950a, b, 1952a, b, e; Sinia

1938, 92; Webber 1941, 441—465 (with litterature references on anatomy).

Type specimen and basonym: *Beccari 2937* (P, dupl. in FI), *type* of *Canarium incurvatum* Engler in DC, Mon. Phan. 4, 1883, 138.

Distribution: Sumatra, Malay Peninsula, Borneo, Luzon, Mindanao.

Tree, 10—30 m high. Branchlets in sicco round or angular, tomentose to glabrous, medulla with some to many, rarely without resiniferous ducts. *Leaves* 1½—4½-jugate; petioles usually strongly flattened at base, minutely tomentose to glabrous, (3.5—)4.5—8.5(—15.5) cm long, 0.2—0.6 cm wide at base, medulla with some to many resiniferous ducts; interjugae 1.5—6 cm long; leaflets glabrous, shining above, rigidly pergamaceous, brownish or greenish when dry, (4—)6—16(—22) cm long, 2—8(—9.5) cm wide, ovate-elliptic to oblong or oblong-lanceolate, base variable, usually rounded, sometimes subcordate, or one half or both halves acute, apex usually rather abruptly acuminate, acumen 0.4—2 cm long, petiolules 0.4—2.5 cm long, terminal ones 1.5—4 cm; midrib prominent at either side; secondary nerves (6—)8—18, little prominent above, much prominent below, s-shaped in the leafbase, angle 60°—90°, in base and apex (sometimes elsewhere as well) archingly joined near the margin; tertiary nerves reticulate to irregularly transverse, not or little prominent, but conspicuous below; reticulation minute, usually rather conspicuous below. *Inflorescences* terminal, sometimes with additional axillary or lateral ones, often branched from the very base, branches minutely tomentose to glabrous, ♂ ones 3—17 cm, ♀ ones and infrutescences 8—21 cm long. *Calyx* cupular or with low-triangular lobes, 0.1—0.125 cm high, 0.25—0.3 cm in diam., densely tomentellous without, glabrous within, as are petals. *Petals* ovate, 0.3—0.4 cm long, 0.25—0.3 cm wide. *Stamens* monodynamous or slightly didynamous, free outside disc or connate with it at broadened base of filaments only, in ♂ flowerbuds 0.15 cm, in ♀ flowers 0.1—0.2 (—0.25 cm in old flowers) cm long, filaments c. 0.1 cm long, anthers in ♂ buds 0.1 cm, in ♀ flowers 0.05 cm long. *Disc* cupular, 6-lobed in ♂ buds, 0.2 cm in diam. *Ovary* tomentose, with 3-lobed sessile stigma, in ♂ flowers rudiment not exsert from disc. *Fruits* ovate, sometimes more or less oblique, (1.4—)1.8—2.7 cm long, 0.8—1.7 cm in diam., lightbrown and rugose when dry, acute at apex, rounded at base; fruiting calyx 0.25—0.4 cm in diam.; fruit pedicels 0.2—0.5 cm long.

SUMATRA. Tapanuli, Sibolga c. a., Barus: *NIFS bb. 31573* (L); Riouw and Dependencies, Indragiri, Muara Serangge: *NIFS bb. 30007* (L); ibid., Belimbing: *NIFS bb. 28553* (L); ibid., Kwala Belilas: *NIFS bb. 27642* (L); ibid., Danau Mengkuang: *NIFS bb. 27519* (BO).

MALAY PENINSULA. Kedah, Kokmoi: *Awang 47883* (KEP); Perak, Piah: *Ja'amat & Tachun 39337* (KEP); Kelantan, Bukit Besi: *Browne 38480* (KEP); Selangor, Klang, Telok: *Symington 47287* (KEP); Rawang: *Ngah 32310* (KEP); Johore, Pekan Nenag: *Othman bin Lassim 70807* (KEP).

BORNEO. West Borneo, Melawi, B. Melaban Ketjit: *NIFS bb. 28332* (L); Sarawak, Matang: *Beccari 2937* (FI, P), fr. XII, *type* of *Can. incurvatum* Engl.; Kuching: *Haviland 2259* (BM, L), ♀ II, *type* of *Can. angulatum* Ridl. in BM; Brunei, Sungei Terban: *Ba'ec & Maidin 36954* (KEP), fr. IV; Seriah Oil Fields: *Symington 35711* (KEP); Kampong Lumut: *Mohd Isa 34413* (KEP, L), ♀ III; British North Borneo, Mt Kinabalu, Gurulau: *Carr 27077* (SING), fr. IV; South and East Borneo, West Kutai, Mo Antjalung: *NIFS bb. 16537* (L); ibid., Long: *NIFS bb. 18458* (BO); Tidung lands, Tanah merah: *NIFS bb. 18258* (BO); ibid., Banusan: *NIFS bb. 18147* (BO).

PHILIPPINES. Luzon, Bataan: *Medina 21827* (US), fr. VI; ibid., Lamao river: *Barnes 517* and *597* (US); ibid., Mount Mariveles: *Borden 808* (K, US); Tayabas (Infanta): *Whitford 768* (K, US), fr. IX, *lectotypes* of *Sant. nitida* Merr.

Remarks: Now that more material has come to hand, *D. incurvata* and *D. angulata* can be identified. The two types are different indeed: *angulata* has stouter and more angular branchlets, broader leaflets with rounded or subcordate base and broad and strongly flattened petioles, while *incurvata* is more slender generally. It appears, however, that intermediate forms are not at all rare and that no natural limit can be drawn so as to establish even two varieties.

Some Luzon specimens (*Whitford 768, Medina 21827*) have broader fruits (ca 2 cm by ca 1.5 cm), one Brunei specimen (*Ba'ee & Maidin 36954*) has smaller ones (1.4 cm by 0.8 cm) than seems to be normal.

This species is closely related to *D. rubiginosa*; for differences see there.

Buttresses are sometimes reported; the bark is green and smooth or "light yellowish brown with green-grey patches"; the resin is white (one collector mentions: green) and usually not abundant; the flowers are green, the fruits greenish. *Habitat*: in primary forests in steep or flat land, some specimens from swampy habitats (Selangor, Brunei). Nearly always collected under 100 m alt., one record from 150 m (Sum., Palemb.), one from 475 m alt. (W.-Born.). *Vernac. names*: kedondong kidjai (Sum., Riouw), kedondong (Kedah, Johore), k. matahari (Kelantan), k. kerut (Selang.), kerantai (Selang.), kembajau, kembojou, rawai, unggit-unggit, tokul gunung, malinas (S. & E. Born.). *Flow. and fruit. time*: In Mal. Penins. fr. in III (Selang.). In Born. fl. in II—III (Saraw., Brun.), fr. in IV (Brun.), from X—III (Br. N. Born.) and in XII (Saraw.). In Luzon fl. in II—III, fr. in VI and IX. In Mindanao fr. in V—VI.

4. D. costata (Bennett) H. J. Lam, 1932a, 204 and 1932b, 359, fig. 17.

Misc. inform.: Hildebrand 1949a, b, d, e, f, g, h, 1950a, b, c, 1952a, b, c, e.

Type specimen and basonym: *Maingay 313/3295* (K, dupl. in CAL), *type* of *Santiria costata* Bennett in Hooker, Fl. Brit. Ind. 1, 1875, 537.

Distribution: Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Philippines (Leyte, f. Lam 1932b).

SUMATRA. Eastcoast, Alur Gusta, Lower Langkat: *NIFS bb. 16617* (L); Tapanuli, Sibolga c. a., Barus, Pankalan Tapus: *NIFS bb. 28443* (L); Westcoast, Pariaman, Pasir Lawas: *NIFS bb. 18054* (BO); Riouw and Dependencies, Indragiri, Danau Mengkuang: *NIFS bb. 27530* (BO) and *bb. 27541* (BO, L); ibid., Muara Padjanki: *Buwalda 6381* (BO, L), ♀ buds IV; Kuantan districts, Sungei Rambei: *NIFS bb. 23474* (L), fr. XI; ibid., Tjeremti: *NIFS bb. 25224* (L); Palembang, Lematang Ilir, Semangus: *NIFS bb. 32262* (L); Sumatra, without loc.: *? Binnendijk 74* (L), ♂ and ♀.

MALAY PENINSULA. Kedah, Bukit Tampai: *Daros 21539* (SING), fr. V; P. Penang, Penang Hill: *Nauen 35843* (SING), fr. VII; Selangor, Sungei Buloh: *Desch 46110* and *46118* (KEP); Bukit Cherake: *Wyatt-Smith 71365* (KEP); Semangko: *Wyatt-Smith 71380* (KEP); Kauching: *Ngah 24854* (SING), ♀ III; Pahang, Raka Hill: *Zin 27748* and *27533* (KEP); Singapore, Bukit Timah: *Ngadiman 36477* (SING); Malay Peninsula, without loc.: *Maingay 313/3295* (CAL, K), ♂ III, *type* of *Sant. costata* Benn.

BANGKA. South Bangka, Perlang: *NIFS bb. 34103* = *Kostermans 169* (BO, L), ♂ IX; ibid.: *NIFS bb. 34117* = *Kostermans 183* (BO, L), ♂ X; Lobok Besar: *NIFS bb. 34062* = *Kostermans 125* (BO, L, SING); ibid.: *NIFS bb. 34173* = *Kostermans 239* (BO, L), ♀ X; ibid.: *Anta 1128* (BO, L, SING), ♀ X; ibid., G. Pading: *Anta 986* and *945* (BO, L, SING), ♂ IX; ibid.: *Anta 1006* (BO, L, SING), ♀ IX.

BORNEO. Sarawak, Sempadi: *Buxton 546* (KEP), ♂ VIII; Labuan, Mount Banbar: *Motley 146* (K); South and East Borneo, Tidung c.a., Tanah Merah: *NIFS bb. 18252* (BO); Berouw, Betemu Aer: *NIFS bb. 18980* (BO, L); East Kutai, Tdg Bangko, S.E. of Samarinda: *Kostermans 7238* (L), fr. VI; ibid., near mouth of Mahakam river: *Kostermans 7109* (L); Loa Djanan, W. of Samarinda: *Kostermans 6459* (L), young fr. IV.

Remarks: For the distinction of this species from *D. rugosa* see under that species.

In *Anta 1006* I observed 1—4 resiniferous ducts in the medulla of the branchlets, an exception in this species, which has usually none.

The description of the inflorescences must be corrected as follows: ♂ ones 6.5—30 cm long, ♀ ones (3—)8.5—18(—21) cm long, infrutescences (4—)8—18 cm long.

The flaking bark is indicated by various collectors as being brown or as whitish, silvery grey; according to one collector the flowers are fragrant; in most cases there are no buttresses, only twice have these been reported (from Bangka and Selangor). *Habitat*: usually not higher than 100 m, some records from about 200 m alt. *Vernac. names*: kening kerak (Sum.), resung (Sum., Eastc.), rasak babi (Sum., Westc.), kedondong besi (Sum., Riouw), k. matahari (Mal. Penins., Selang.), bunjou, binjau, sudur bajan (Bangka), basi-basi, kramu, limat (S. & E. Born.). *Flow. and fruit. times*: In Sum. fl. in IV (buds, Riouw) and IX (Palemb.), fr. in IV (Palemb.) and XI (Riouw). In Mal. Penins. fl. in III (Selang., Mal.), fr. in VII (P. Pen.). In Bangka fl. in IX—X. In Born. fl. in VII—VIII (W. Born., Saraw.), fr. between X—III (Br. N. Born.) and in VI (S. & E. Born.). *Uses*: In Borneo the wood is used for proahs (S. & E. Born.) and for light constructions (Saraw.).

5. D. longifolia (King) H. J. Lam, 1932a, 202 and 1932b, 340, fig. 9; Symington 1937, 319.

Misc. inform.: Sinia 1938, 85, 92.

Type specimen and basonym: *King's coll. 6838* (dupl. in L), *type* of *Santiria longifolia* King, J. As. Soc. Beng. 62, 2, 1893, 258.

Distribution: Malay Peninsula (Perak, P. Penang), endemic.

Remarks: This species seems to be very rare; I did not see any new material. What Lam says (1932b, 342) about reducing or eliminating the varieties when more material will be available, still holds.

Var. **longifolia** — *D. longifolia* (King) H. J. Lam var. *typica* H. J. Lam, 1932a, 203 and 1932b, 340.

Distribution: Perak.

MALAY PENINSULA. Perak, Larut: *King's coll. 6838* (L), fr. XI, *isotype* of *Sant. longifolia* King.

Var. **penangensis** (Ridley) H. J. Lam, 1932a, 203 and 1932b, 342.

Type specimen and basonym: *Curtis 3648* (K, dupl. in SING), *type* of *Curtisina penangensis* Ridley, J. Str. Br. Roy. As. Soc. 82, 1920, 180.

Distribution: P. Penang.

MALAY PENINSULA. P. Penang, Government Hill: *Curtis 3648* (K, SING), ♂ V, *type* of *Curt. penangensis* Ridl.

6. **D. expansa** (Ridley) H. J. Lam, 1932a, 204 and 1932b, 366, fig. 21. — *Fig. 2.*

Type specimen and basonym: *Haviland 2271* (K, dupl. in SING), *type* of *Canarium expansum* Ridley, Kew Bull. 1930, 83.

Distribution: Borneo (Saraw., Brun.), endemic.

Descriptio aucta: Small tree. Branchlets 0.5—c. 1.5 cm thick, glabrous, medulla without resiniferous ducts. *Leaves* glabrous, c. 4½-jugate? (no complete leaves seen); petiole (one seen) 9.5 cm long, c. 0.4 cm thick at base, not flattened, lenticellate, medulla with some resiniferous vascular bundles; interjugae 5—6.5 cm long; leaflets coriaceous or chartaceous, oblong to oblong-lanceolate, 17—29.5 cm long, 5.2—10 cm wide, base acute, apex rather shortly acuminate, petiolules with joints at both ends, 2.5—4 cm long, terminal ones 5—6.5 cm long, acumen 0.5—1.4 cm long; midrib not prominent above, prominent below, as are secondary nerves; secondary nerves 12—17 and some inconspicuous ones in apex, angle 50°—60°, curved, not joined near margin; tertiary nerves irregularly transverse, not very conspicuous above, little prominent below; reticulation lax and faint. *Inflorescences* (only ♂ ones known) lateral or on leafless lateral or axillary shoots with terminal buds, (5—)13—21 cm long, peduncle 0—5.5 cm long, lowest ramifications 2—11 cm long, glabrous, lax, paniculate. *Flowers* (only ♂ ones known) glabrous, 0.5 cm long. *Calyx* cupular, 0.2 cm long, segments broadly deltoid. *Petals* very thin, ovate oblong, broadly acute to subrounded and minutely inflexed at apex, 0.4—0.45 cm long. *Stamens* monodynamous, free outside the disc, 0.35 cm long, filaments subulate, anthers ovoid, somewhat shorter than filaments, 0.15 cm long. *Disc* thick and radially furrowed or more or less undulate, cupular or annular. *Ovarial rudiment* small,

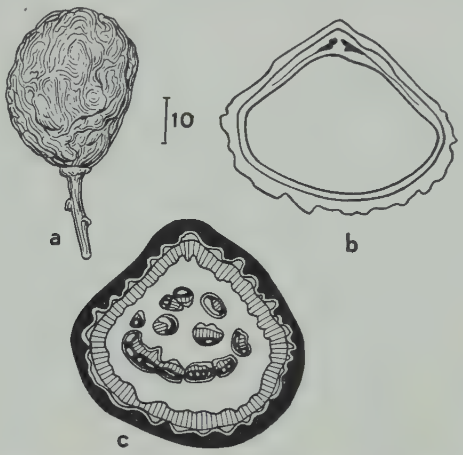

Fig. 2 — *Dacryodes expansa* (Ridley) H. J. Lam — a. fruit; b. idem, cross-section; c. petiole, cross-section. — dimensions in mm — a. and b. from *Symington 35518*, c. from *Haviland 2271.*

slightly exsert from the disc, narrowly oblong, stigma with 3 minute lobes. *Infrutescence* (one seen) 27 cm long, glabrous, peduncle 7 cm long. *Fruit* (one seen) globoid-ellipsoid, slightly triangular in cross-section, 3.5 cm long, 3 cm in diam., style c. 45° excentric, coarsely wrinkled and pustulous when dry, pericarp 0.1—0.2 cm thick, putamen woody, 0.1—0.15 cm thick; fruitstalk 0.5 cm long, 0.25 cm thick; fruiting calyx 0.6 cm in diam.

BORNEO. Sarawak, Kuching: *Haviland 2271* (K, SING), ♂ I, *type* of *Can. expansum* Ridl.; Brunei, Pengkalan Ran, Tutong River: *Symington 35518* (KEP), fr. VIII.

Remarks: The fruits are (according to Symington) "slightly oblique, purple when unripe, pericarp white, eaten". *Habitat*: Symington mentions as habitat: "Edge of rubber estate, said to be jungle tree." *Vernac. names*: sabal, sibut (Brunei). *Flow. and fruit. time*: flow. in I (Sar.), fr. in VIII (Brun.).

7. D. breviracemosa nov. spec. — *Fig. 3.*

Type specimen: *Carrier 53375* in KEP.

Distribution: one specimen, collected in Malay Peninsula (Trengganu).

Tree; branchlets ca 0.4 cm thick, ferruginous-tomentose at the extreme tips, as is the terminal bud, medulla without resiniferous ducts. *Leaves* 2½-jugate, glabrous; petioles flattened at base, 3—4.5 cm long, 0.15—0.2 cm wide at base, medulla with some resiniferous vascular bundles; interjugae 2—3 cm long; leaflets ovate-oblong, 7.5—11 cm long, 3.5—6 cm wide, base rounded and decurrent, apex gradually narrowed into a rather broad acumen, petiolules 1—1.6 cm long, terminal ones 2.5—3 cm long; nervation not prominent above, rather prominent below; secondary nerves 10—12, angle with midrib from ca 45° in apex to ca 75° at base, curved, not archingly joined near margin except in apex; tertiary nerves transversely reticulate. *Inflorescences* and *flowers* unknown. *Infrutescences* lateral, at the tips of branchlets, short, 3—6 cm long, peduncle 0.5—1 cm long, with 1—4 fruits. *Fruits* elliptic, stigmatic scar nearly apical, apex broadly acute, base rounded, 1.6—1.8 cm long, 0.9—1.1 cm in diam., pericarp and putamen rather thin, cotyledons palmate in the seed, contortuplicate?; fruiting calyx 0.35—0.4 cm in diam., with 3 deltoid lobes; disc under fruit annular, radially furrowed and undulated, remainders of filaments broadened at base and inserted outside disc, those of anthers lanceolate-ovate; fruit pedicel 0.3—0.4 cm long, 0.15—0.2 cm thick.

Descriptio typi: Ramuli apicem versus ferrugineo-tomentosi, medulla aresinosa. *Folia* 2½-jugata, glabra; petioli deplanati, 3—4.5 cm longi, basi 0.15—0.2 cm lati, medulla nonnullis fasciculis vasorum resiniferis suffulta; partes interjugales 2—3 cm longae; foliola ovato-oblonga, 7.5—11 cm longa, 3.5—6 cm lata, basi rotundata, apice gradatim angustata in acumen sublatum contracta, petioluli laterales 1—1.6 cm, terminales 2.5—3 cm longi; nervatio supra haud, subtus conspicue prominens; nervi secundarii 10—12, non arcuatim conjuncti, tertiarii reticulato-transversi. *Inflorescentiae* floresque ignoti. *Infrutescentiae* laterales, apice ramulorum versus confertae, breves, 3—6 cm longae, pedunculo 0.5—1 cm longo. *Fructus* ellipticus, 1.6—1.8 cm longus, 0.9—1.1 cm diam., styli rudimento vix excentrico, pericarpio putamineque tenuibus, cotyledones palmatae; calyx fructiger 0.35—0.4 cm diam.; pedicelli 0.3—0.4 cm longi, 0.15—0.2 cm crassi.

MALAY PENINSULA. Treggganu, Dungun, Bukit Bauk: *Carrier 53375* (KEP), fr. X, *type*.

Remarks: Tree, ca 18 m high, slightly buttressed; bark mottled green and greyish-purple, smooth with numerous shallow depressions; natural size of fruits 2.5 by 1.2 cm, colour pinkish. *Habitat*: steep slope, alt. 30 m. *Vern. name*: kedondong (?).

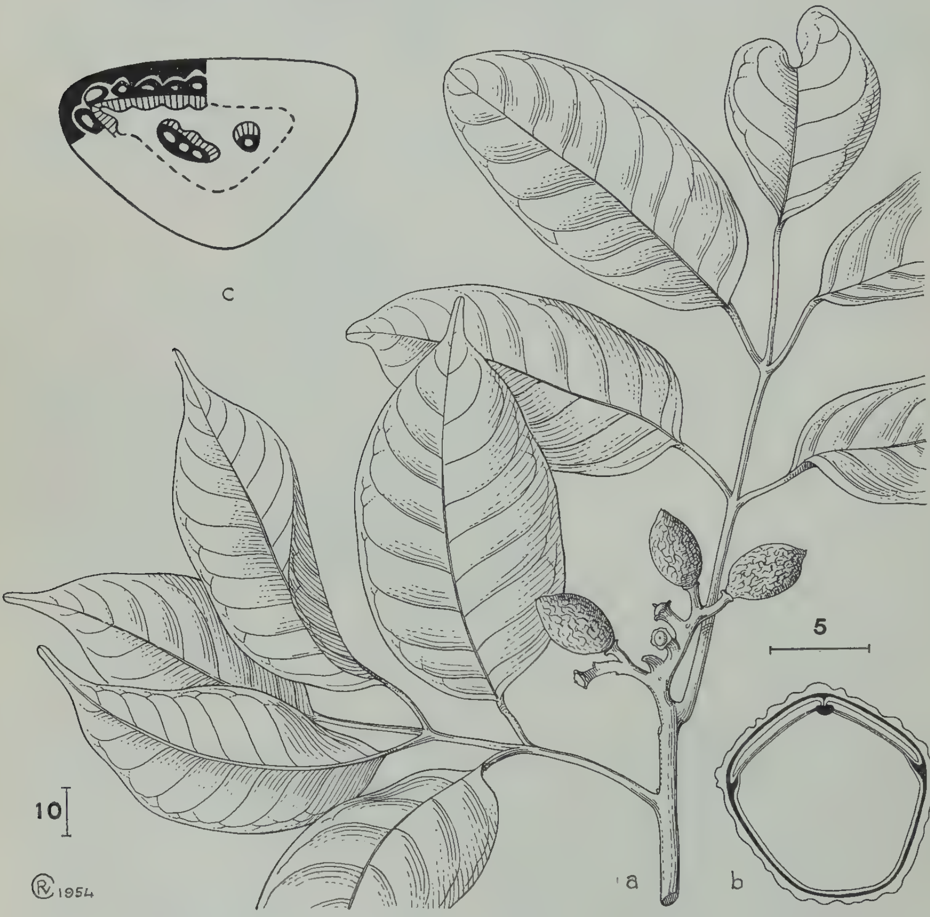

Fig. 3 — *Dacryodes breviracemosa* Kalkman — a. branchlet with leaves and infrutescences; b. fruit, cross-section; c. petiole, cross-section. — dimensions in mm — from the type.

8. D. puberula (Bennett) H. J. Lam, 1932a, 204 and 1932b, 354, fig. 14.

Type specimen and basonym: *Maingay 311/1534* (K), *type* of *Santiria puberula* Benn. in Hook., Fl. Brit. Ind. 1, 1875, 537.

Distribution: Malay Peninsula (Pahang, Negri Sembilan, Malacca, Singapore Island).

Trees. Branchlets slender, 0.2—0.3 cm thick, puberulous and glabrescent, medulla sclerenchymatic, without or with one resiniferous duct. Terminal bud rather long and narrow. *Leaves* 1½—4½-jugate; petioles slender, 2—6.5 cm long, flattened at base, striate, puberulent and glabrescent, medulla with one to some resiniferous vascular bundles; interjugae 1.5—4.5 cm long; leaflets thin, elliptic to ovate, 4.5—12.5 cm long, 2.5—6.5 cm wide, base usually very oblique, one half rounded to broadly acute, other half acute, apex gradually to subabruptly acuminate, acumen 0.2—1 cm long, petiolules 0.5—1.5 cm long, terminal ones 2.3—3.5 cm long, base of midrib somewhat pubescent on upper side, on lower side all nerves puberulous; venation hardly conspicuous above, midrib and secondary nerves prominent, tertiary nerves and reticulation conspicuous below; secondary nerves 7—11, angle 45°—80°, curved near the margin and diminishing, not joined but in the apex; tertiary nerves transversely reticulate. *Inflorescences* (only ♂ ones seen) axillary, puberulent and glabrescent, 3.5—12 cm long, peduncle 0—2.5 cm long,the few ramifications spreading and lax, 0.5—5 cm long. *Flowers* (only ♂ ones seen) 0.2 cm long and in diam., distinctly pedicelled; bracts minute, deciduous. *Calyx* pubescent without. *Petals* thin, sparsely pubescent without, with slightly thickened and inflexed apiculum, much exsert from calyx. *Stamens* inserted on or very near rim of disc, didynamous in bud, nearly monodynamous when adult, ca 0.15 cm long; filaments broadened at base, in bud shorter than anthers, longer than these when adult and then ca 0.1 cm long; anthers 0.05—0.075 cm long, elliptic. *Disc* with undulate rim. *Ovarial rudiment* small, not exsert from disc. *Infrutescences* axillary and lateral at tips of branchlets, 3—5 cm long, puberulous, peduncle 0—1.5 cm long. *Fruits* elliptic, ca 1.5 cm long and 0.9—1 cm in diam., style rudiment nearly apical, pericarp coarsely rugose when dry, putamen rather thick; fruiting pedicels 0.1—0.2 cm long, 0.1 cm thick, puberulous; fruiting calyx spreading, puberulous without.

MALAY PENINSULA. Pahang, Putat: *Baba 10800* (KEP); Negri Sembilan, Port Dickson, Sungei Mengala: *Wyatt-Smith 64498* and *64788* (KEP); Malacca, Selandar: *Alvins 529* (SING), fr. I; no loc.: *Maingay 311/1534* (K), ♂ XI, *type*; Singapore, Mac Ritchie Reservoir: *Corner 32536* (SING), ♂ XII.

Remarks: The specimen *Forbes 3093* from Sumatra, after which Lam's figure 14c has been drawn, belongs to *Santiria apiculata.*

Trees, 15—21 m high, with small buttresses and scaling bark, that is reported as smooth to rough, green and pale brown, orange pink under the scales (*Wyatt-Smith 64498*) or as yellowish mauve brown (*Wyatt-Smith 64788*); petioles and petiolules fawn brown; flowerbuds greenish. *Habitat*: Forest, at low altitudes. *Vern. names*: kedondong, k. krut. *Flow. and fruit. times*: Fl. in XI—XII, fr. in I. *Uses*: According to *Alvins 529* wood very hard and durable, used in house building.

9. D. papuana Husson in Husson & Lam, 1952b, 167, fig. 1.

Type specimen: *Brass & Versteegh 13535* (L).

Distribution: one specimen collected in West Central New Guinea.

Tree, 30 m high. Branchlets rather slender, smooth, 0.4—0.6 cm thick, medulla without resiniferous ducts. *Leaves* 2½-jugate (only one leaf seen); petioles slightly flattened at base, 5—5.5 cm long; interjugae 3.5—4 cm long, medulla without resiniferous ducts; leaflets elliptic, glabrous, subcoriaceous, 8.5—11.5 cm long, 4—5 cm wide, shining dark olive brown when dry, base little inequilaterally rounded, apex shortly acuminate, acumen 0.7—0.9 cm long, 0.4—0.5 cm wide, rounded, petiolules channeled, 1.5—2.2 cm long, terminal ones 1.7—3 cm long; midrib little prominent above, prominent below; secondary nerves 7—11, angle (40°—)50°(—70°), curved, not directly joined near the margin; tertiary nerves laxely reticulate, as conspicuous as the secondary ones; reticulation conspicuous. *Inflorescences* and *flowers* unknown. *Infrutescences* lateral, 11—12 cm long, with few fruits. *Fruits* ellipsoid, 2.7—3 cm long, 1.5 cm in diam., one-seeded, stigma apical, pericarp fleshy, putamen 0.03 cm thick, cotyledons contortuplicate in the seed; pedicel 0.7—1 cm long; fruiting calyx annular, 0.5 cm in diam.

New Guinea. West Central New Guinea, Idenburg River, 2 km S.W. of Bernhard Camp: *Brass & Versteegh 13535* (L), fr. IV, alt. 650 m, occasional on slopes, primary forest, bark with some colourless resin, *type*.

10. D. macrocarpa (King) H. J. Lam, 1932a, 203 and 1932b, 342, fig. 10.

Misc. inform.: Hildebrand 1949b, f, h, 1950b; Sinia 1938, 92.

Type specimen and basonym: *King's coll. 7298* (K, dupl. in CAL, SING), *lectotype* of *Santiria macrocarpa* King, J. As. Soc. Beng. 62, 2, 1893, 256.

Distribution: Sumatra, Malay Peninsula, Lingga Archipelago, Borneo, Luzon.

Remarks: Trees of about 10—25 m high, buttressed. Flowers white to yellow, scarcely fragrant. Fruits yellowish white to pinkish. *Habitat*: at very low altitudes, sometimes in wet, swampy localities. *Vernac. names*: paoh-paoh (Brunei), madang lada, m. talsak (Brit. N. Born.). *Flow. and fruit. times*: In Sum. fr. in I (Palemb.). In Mal. Penins. fl. in IX (Joh.), fr. in XII and III (Perak.). In Born. fl. in X—XI (Sar.) and II (Brun.), fr. in X (Sar.) and II—IV (Brun., Br. N. Born., Saraw.). Var. *merrillii* fl. in III. *Uses*: wood used for sawn timber (*Cuadra A 1301*).

Var. **macrocarpa** — *D. macrocarpa* (King) H. J. Lam var. *genuina* H. J. Lam, 1932a, 203 and 1932b, 343.

Distribution: Sumatra, Malay Peninsula, Lingga Archipelago, Borneo.

Sumatra. Eastcoast, Selatpandjang, Penjengat: *NIFS bb. 21519* (L); Tapanuli, Sibolga District, Barus, Pondok Rotan: *NIFS bb. 29556* (L), young fr. X; ibid., *NIFS bb. 29550* (L); Riouw and Dependencies, Indragiri, Belimbing: *NIFS bb. 28516, bb. 28544, bb. 28546, bb. 28566* (L).

Malay Peninsula. Perak, Larut: *King's coll. 7298* (CAL, K, SING), fr. III, *type* of *S. macrocarpa* King; Selangor, Sungei Buloh: *Symington 38128* (KEP); Johore, Mawai-Temaluang Road: *Corner 31949* (SING), ♂ IX; ibid.: *Corner 34910* (SING).

Borneo. Sarawak, near Kuching: *Haviland & Ulak 1904* (K), ♀ & fr. X; Stampin: *Sow 368* (KEP), buds IX; Brunei, Seria-Penaga Road: *Flemmich 32613* (KEP), ♀ buds & fr. II; Anduki: *Abot 37143* (KEP), fr. IV; British North Borneo, Sandakan, Beaufort Lumat: *Cuadra A 1301* (KEP, L, SING), fr. III; ibid.: *Cuadra A 1303* (KEP, L), fr. III; South and East Borneo, Balikpapan, Sungei Wain: *Kostermans 4099* (L).

Var. **merrillii** H. J. Lam, 1932a, 203 and 1932b, 344.

Type specimen: *Alambra 27097* (US).

Distribution: one specimen collected in Luzon.

Philippines. Luzon, Camarines, Paracale: *Alambra 27097* (US), ♂ III, *type*.

11. D. kostermansii nov. spec. — *Fig. 4.*

Type specimen: *Kostermans 6725* in L.

Distribution: S. & E. Borneo.

Tree; branchlets 0.5—0.7 cm thick, glabrous, with rather large and prominent lenticels, medulla without resiniferous ducts. Leaves 2½—3½-jugate; petioles flattened at base, 4.5—7.5 cm long, 0.3—0.5 cm wide at base, glabrous, medulla with some resiniferous vascular bundles; interjugae puberulous to glabrous, 2.5—5 cm long; leaflets ovate to broadly ovate (apical leaflet often obovate), (7—)11—16 cm long, (5—)6—8.5(—12) cm wide, glabrous save sometimes a very slight pubescence on midrib below, base oblique, rounded and decurrent, one half sometimes broadly acute, apex gradually narrowed into a broad and short acumen; petioles puberulous to glabrous, 0.8—1.8 cm long, terminal ones 2.2—4 cm long; midrib prominent, especially below; secondary nerves (8—)10—14, conspicuous above, prominent below, angle with midrib from ca 75° at base to ca 60° in apex, curved near margin, not directly archingly joined except in apex; tertiary nerves transversely reticulate near margin, parallel with secondary nerves near midrib, conspicuous above, rather prominent below. *Inflorescences* and *flowers* unknown. *Infrutescences* lateral on leafless axillary shoots (with terminal bud), 8—10 cm long, puberulous to glabrous. *Fruits* elliptic,

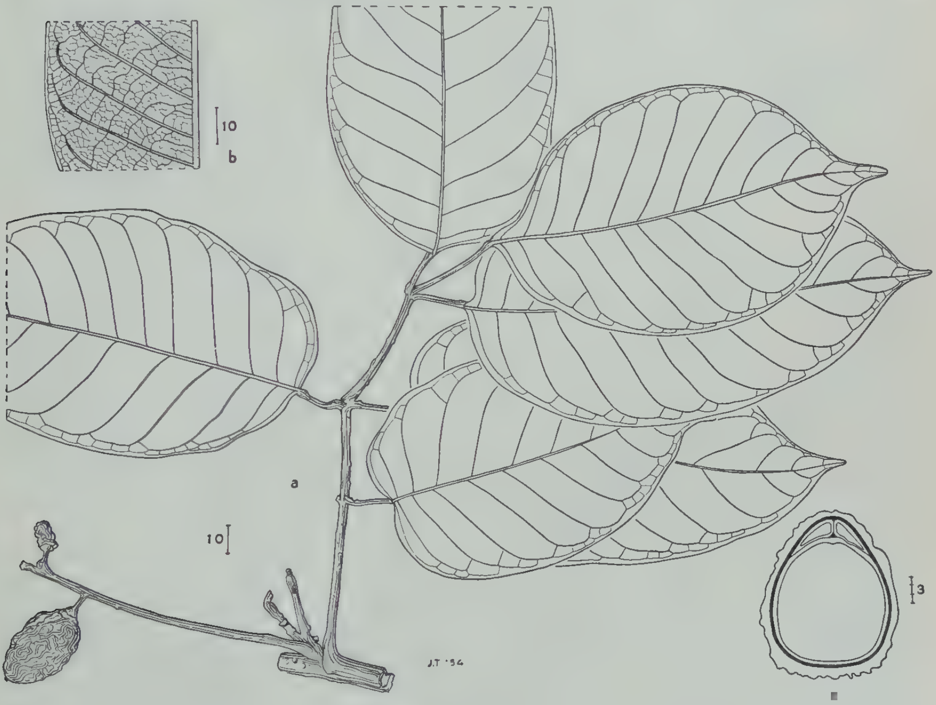

Fig. 4 — *Dacryodes kostermansii* Kalkman — a. branchlet showing leaf and infrutescence; b. part of leaflet; c. fruit, cross-section. — dimensions in mm — from the type.

2.8—3.2 cm long, 1.6—2 cm in diam., stigmatic scar nearly apical, base rounded, apex acute, pericarp thick, mesocarpal layer thin, putamen rather thick, embryo unknown; fruiting calyx truncate, 0.45—0.5 cm in diam., glabrous.

Descriptio typi: Arbor; ramuli glabri, medulla aresinosa. *Folia* 3½-jugata; petioli valde deplanati, 5—7.5 cm longi, basi 0.4—0.5 cm lati, glabri, medulla nonnullis fasciculis vasorum resiniferis suffulta; partes interjugales 2.5—5 cm longae, puberulentes vel glabrae; foliola ovata, (9—) 13—16 cm longa, (5—)6—8.5 cm lata, supra glabra, subtus costa media puberula, basi obliqua, rotundata, apice gradatim angustata in acumen latum et breve contracta; petioluli puberuli, laterales 1.3—1.8 cm, terminales 2.8—3.2 cm longi; costa media subtus prominens; nervi secundarii 10—14, non arcuatim conjuncti, supra conspicue prominentes, subtus prominentes; nervi tertiarii reticulato-transversi. *Inflorescentiae* floresque ignoti. *Infrutescentiae* laterales in turionibus axillaribus afoliosis, alabastro terminale suffulta, 8—10 cm longae. *Fructus* ellipticus, 2.8—3.2 cm longus, 1.6—2 cm diam., styli rudimento vix excentrico, pericarpio crasso, mesocarpio tenui, putamen subcrassum; calyx fructiger 0.45—0.5 cm diam.

BORNEO. South and East Borneo, Loa Djanan, W. of Samarinda: *Kostermans 6725* (L), fr. IV, *type*; Balikpapan, Sungei Wain: *Achmat bb. 34358* (L); Boven Dajak, Rudjak: *NIFS bb. 27746* (L, SING).

Remarks: This species, named in honour of Dr Kostermans, collector of the type specimen, is related to *D. macrocarpa*, but has a much more prominent nervation on the lower side of the leaflets.

Tree, 35 m high, buttressed; bark yellowish, rather smooth and mottled, scaling off in very large pieces; fruits acid, edible, light red. (Kostermans). *Habitat*: at low altitudes, up to 50 m. *Vernac. names*: asam, asem, rarawa pipit.

12. D. crassipes nov. spec — *Fig. 5.*

Type specimen: *NIFS bb. 25210* in L.

Distribution: one specimen, collected in Sumatra.

Tree? Branchlets rather thick, ca 1 cm, lenticellate, puberulent at the tips, medulla with many resiniferous ducts. *Leaves* 3½—4½-jugate; petioles strongly flattened, (4.5—)7.5—10 cm long, 0.5—0.6 cm thick at base, pubescent, medulla with many resiniferous vascular bundles; interjugae 2—3.7 cm long; leaflets ovate, 5—12.5 cm long, 3—6.3 cm wide, glabrous, thick coriaceous, olive green when dry, base rounded to subcordate (terminal leaflet broadly acute), apex rather abruptly acuminate, acumen 0.3—1 cm long, petiolules pubescent, 0.4—1 cm, terminal ones 1.5—2.4 cm long; midrib not very prominent above, prominent below; secondary nerves 10—13, hardly prominent above, prominent below, straight almost up to margin, then curved and not archingly joined but by strong tertiary nerves; tertiary nerves reticulate, usually a stronger and parallel one between two secondary nerves, reaching halfway up margin or more, conspicuous above, rather prominent below, as is reticulation. *Inflorescences* and *flowers* unknown. *Infrutescences* lateral, conferted at tips of branchlets (terminal bud extant), stout, 7.5—10 cm long, peduncle about half the length of the whole infrutescence, hardly branched, pubescent, angular when dry. *Fruits* only known with galls or sterile; fruiting calyx cupular with three faint lobes,

hardly broader than the pedicel, c. 0.5 cm in diam.; fruit stalks 0.4—0.5 cm long, 0.4 cm thick, pubescent; *disc* under the fruit cupular; remainders of the six *stamens* inserted outside the disc, filaments broadened; *petals* (only one seen under the fruit) pubescent without.

Descriptio typi: Arbor? Ramuli subcrassi (1 cm), medulla multis ductis resiniferis percursa. *Folia* 3½—4½-jugata; petioli valde deplanati, (4.5—)7.5—10 cm longi, medulla multis ductis resiniferis percursa;

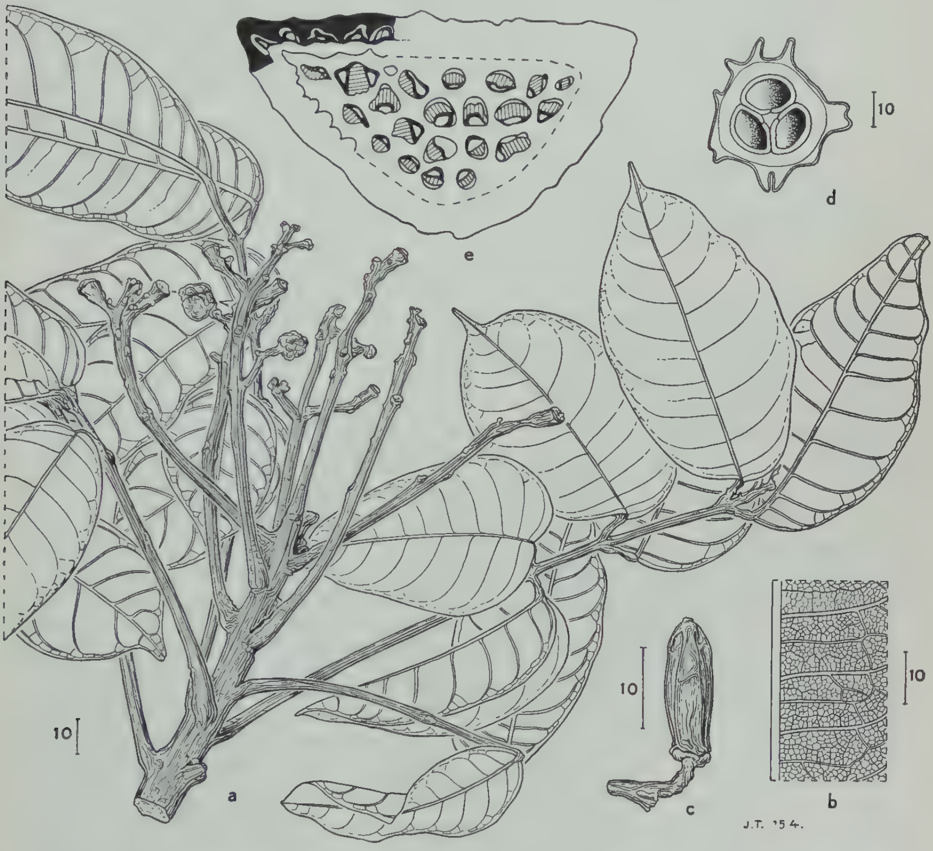

Fig. 5 — *Dacryodes crassipes* Kalkman — a. branchlet with leaves and infrutescences (with galls); b. part of a leaflet, showing venation; c. fruit; d. idem, cross-section; e. petiole, cross-section. — dimensions in mm — from the type.

partes interjugales 2—3.7 cm longae; foliola ovata, 5—12.5 × 3—6.3 cm, glabra, rigido-coriacea, basi rotundata ad subcordata (in foliolo terminali acuta), apice subabrupte acuminata; petioluli pubescentes, laterales 0.4—1, terminales 1.5—2.4 cm longi; costa supra paulo, subtus conspicue prominens; nervi secundarii 10—13 subtus prominentes, tertiarii reticulati. *Inflorescentiae* floresque ignoti. *Infrutescentiae* laterales, apices ramulorum versus confertae (gemma vegetativa terminale conspicua), robustae, 7.5—10 cm longae, pedunculo circiter dimidio breviore vix ramosae. *Fructus* (sterilis

vel deformati) calyx subtrilobatus, circ. 0.5 cm diam., pedicelli 0.4—0.5 cm longi, discus cupularis, staminum 6 rudimenta extra discum inserta.

SUMATRA. Riouw and Dependencies, Kuantan Districts, Tjerenti: *NIFS bb. 25210* (L), fr. VIII, alt. 50 m, *type.*

Remarks: Though this specimen possesses only sterile fruits, it is probably to be identified as a *Dacryodes.* The infrutescences are exactly like those of *D. rostrata,* particularly forma *cuspidata.* It differs, however, from that species in the following points: the petioles are pubescent, shorter and strongly flattened; the leaflets are much more coriaceous, with a rounded or subcordate base, the angle of secondary nerves and midrib is larger, the tertiary nerves, joining the secondary ones near the margin, are stronger; the infrutescences are shorter.

The nervation makes one think of *D. incurvata,* but the infrutescences are not terminal, the branchlets too thick and the fruit calyces too large so as to allow an insertion in that species.

13. D?. scandens Husson in Husson & Lam 1952a, 164, fig. 1.

Type specimen: *Clemens 31095* (L, dupl. in K).

Distribution: one specimen collected in British North Borneo.

According to Clemens surely scandent. Branchlets rather slender, c. 0.3—0.4 cm in diam., lenticelled, medulla with many peripherally arranged resiniferous ducts. *Leaves* ½—2½-jugate; petioles not flattened, glabrous, 5.9—7.5 cm long, medulla with two resiniferous vascular bundles; interjugae 2.5—3 cm long; leaflets ovate-oblong, 7—14 cm long, 2.5—6.5 cm wide, base rounded, apex gradually or subabruptly acuminate, subcoriaceous, glabrous above, minutely pulverulent on the nerves below, petiolules 0.3—0.6 cm long, terminal ones 1.3—3 cm, acumen 0.5—1.2 cm long, 0.15—0.4 cm wide; midrib prominent at either side; secondary nerves 10—13, angle 60°—70°, curved, archingly joined by tertiary nerves; reticulation conspicuous at either side. *Inflorescences* (only ♂ ones known) terminal, 33 cm long, with 8—15 cm long, slender ramifications, or axillary and lateral, 7—10 cm long and not branched; bracts minute; pedicels 0.2—0.5 cm long. *Flowers* (only ♂ ones known) in few-florous cymules, glabrous, 0.3 cm in diam. *Calyx* c. 0.2 cm high, lobes deltoid. *Petals* oblong-ovate, 0.3 cm long, 0.2 cm wide, not thickened at apex. *Stamens* inserted outside disc, connate only at very base, slightly didynamous, glabrous; filaments broadened at base; anthers acuminate. *Disc* pilose, with a central channel. No ovarial rudiment. *Infrutescences* and *fruits* unknown.

BORNEO. British North Borneo, Mount Kinabalu, Penibukan: *Clemens 31095* (K, L), ♂ I, alt. 1200—1500 m, by trail, on ridge, *type.*

Remarks: Although my opinion could not be based on fruit-characters, I am inclined to believe that this specimen is not a *Dacryodes,* but a *Canarium* (group of *C. pilosum*). The flower is not *Dacryodes*-like: pilose disc with central channel, slightly connate filaments (Husson's description mentions "stamina libra", the figure is correct). A decision must be postponed until the intended revision of *Canarium* has been completed.

For the comparison with *D. rugosa* var. *virgata* in Husson & Lam 1952a, 165, see the remarks to that variety.

14. D. rostrata (Blume) H. J. Lam, 1932a, 203 and 1932b, 349, fig. 13; Cretzoiu 1934, 265; Lam 1938, 156; Lam 1945, 610.

Misc. inform.: Burkill 1935, 430 (sub *Canarium kadondon* Benn.); Hildebrand 1949a, b, c, e, f, g, h, i, 1950a, b, 1951a, 1952a, b, c, e; Pref. names 1952; Sinia 1938, 69—102; Webber 1941, 441—465.

Type specimen and basonym: *Korthals s.n.* (L, nr 898.321—228), *type* of *Santiria rostrata* Blume, Mus. bot. Lugd.-Bat. 1, 14, 1850, 213.

Distribution: Cochin China, Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Palawan, Luzon, Samar, Leyte, Mindanao, Northern Celebes.

The delimitation of the forms of this very polymorphous species is extremely difficult: doubtful cases are numerous. Some of these have been mentioned underneath. With the exception of forma *samarensis* (now identified with forma *cuspidata*) I have maintained Lam's subdivision. In the list of specimens the formae have been indicated by *cu, pa, pu* or *ro* respectively, transitions by e. g. *ro-cu* (*rostrata*, transitional to *cuspidata*).

Key and descriptions of formae:

1a. Leaflets glabrous, save sometimes a slight pubescence at base of midrib below 2

b. Leaflets pubescent underneath. — Leaves 7½—9½-jugate; leaflets ovate-oblong, (5.5—)10—20 cm long, 3—8 cm wide, light greyish brown or greyish green when dry; secondary nerves 8—15; reticulation rather minute; inflorescences up to 33 cm long. *Borneo* forma **pubescens** [H. J. Lam, 1932a, 203 and 1932b, 351]

2a. Reticulation minute, on lower side of leaflets usually inconspicuous, sometimes more or less distinct, but not prominent 3

b. Reticulation prominent on either side of leaflets, minute or more or less lax. — Leaves 3½—8½(—10½)-jugate; petioles 8.5—20.5(—26) cm long, up to 0.8 cm wide at base; leaflets ovate to oblong, (7—)10—20(—22) cm long, (2.5—)4—7(—8.5) cm wide, brownish when dry, sometimes greyish above; secondary nerves 8—15; inflorescences 9—26 cm long. *Cochin China, Sumatra, Borneo, Palawan, Luzon, Samar, Leyte, Mindanao, N. Celebes. (Dracontomelon cuspidatum* Blume, Mus. bot. Lugd.-Bat. I, 14, 1850, 232 — *Dacr. rostrata* (Bl.) H. J. Lam forma *samarensis* [H. J. Lam, 1932a, 203 and 1932b, 351])
forma **cuspidata** [(Blume) H. J. Lam, 1932a, 203 and 1932b, 351]

3a. Leaflets oblong, upper side usually shining light grey, lower side light brown when dry; secondary nerves 10—20. — Leaves 4½—9½-jugate; petioles (8.5—)10—20 cm long; leaflets (5.5—)7—17.5 cm long, (2.5—)3—6.5 cm wide, margins usually reflexed, forming a stiff, narrow ridge; inflorescences 15—30 cm long. *Sumatra, Banka, Borneo, Luzon, Samar, Mindanao*
forma **pallida** [H. J. Lam, 1932a, 203 and 1932b, 351]

b. Leaflets ovate to oblong, in sicco usually light brown at either side; secondary nerves 5—12. — Leaves 2½—6½-jugate; petioles (2.5—)4—14(—18.5) cm long; leaflets (3.5—)5—15(—21) cm long, (1.5—)2.5—7(—9) cm wide; inflorescences (1.5—)5—20(—35) cm long. *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo. (D. rostrata* (Blume) H. J. Lam forma *genuina* [H. J. Lam, 1932a, 203 and 1932b, 351])
forma **rostrata**

COCHIN CHINA. Bienhoa, Trang-Bom: *Fleury 30085* (P), fr. III, *cu*; Southern Cochinchina, Chiaoschan: *Pierre 4260* (P), *cu*.

SUMATRA. Tapanuli, Sibolga, Kualagarigi, P. Punei: *NIFS bb. 19286* (BO), *cu*; ibid., Sibung-Sibung: *NIFS bb. 19351* (BO, L), *cu*; ibid., P. Punei: *NIFS bb. 19656* (BO, L), *cu*; Westcoast, Mentawei Islands, P. Siberut, Sibaguana: *NIFS bb. 17465* (L), *cu*; Riouw and Dependencies, Indragiri, Muara Serangge: *NIFS bb. 30099* (L), *ro*; Palembang, Lematang Ilir: *NIFS T 352* (L), ♂ X, *lectotype* of forma *pallida* H. J. Lam; ibid., Semangus: *NIFS bb. 31695* (L), *bb. 32061* (L) and *bb. 32135* (BO), *pa*; ibid.: *NIFS bb. 31993* (L), *pa-cu*; no loc.: *Praetorius s.n.* (L, nr 897.363—272), *cu*, cf. Remarks; Sumatra, without loc.: *Korthals s.n.* (L, nr 897.363—271), *cu*, cf. Remarks; ibid.: *Teysmann s.n. = 4278?* (W), fr., *ro;* ibid.: *Praetorius s.n.* (L, nr 898.321—210), *ro.*

MALAY PENINSULA. Langkawi Isl., Gunong Raya: *Rahim 12368* (KEP), young fr. IV, *ro*; Kedah, Baling, Lubok Che Mann: *Meh 17754* (KEP), *ro*; Bukit Malut: *Rahim 12428* (KEP), fr. IV, *ro*; Peranginan: *Awang 31321* (KEP), *ro*; P. *Penang,* Penang Hill; *Nauen 35846* (SING), fr. VII, *ro*; ibid.: *Nauen s.n.* (SING), fr. IX, *ro*; Ayer Etam: *Curtis 495* (CAL), young fr. XI, *ro*; Waterfall: *Curtis 1433* (SING), *ro*; no loc.: *Cantleys coll. 2585* (SING), young fr., *ro*; Perak, Larut: *King's coll. 6707* (CAL, FI), *ro*; ibid.: *King's coll. 7577* (A, CAL, DD, E, FI, G), young fr. V, *ro*; ibid.: *King's coll. 7611* (CAL, DD, MEL), fr. V, *ro*; Banks of Bernam river: *King's coll. 8801* (CAL, G, L, Z), IV, *ro*; Upper Perak: *Wray 3392* (CAL), *cu-ro*; Pahang, Rotan Tunggal: *Brown 29377* (KEP), *ro*; Putat: *Baba 10788* (KEP), *ro*; Kemaman, Bukit Kajang: *Corner s.n.* (SING), sapling, *ro*; Malacca, Bukit Minyak: *J. S. G(oodenough) 1469* (BM, CAL, G), fr. *ro*; Johore, Sedili river below Mawai: *Corner 36970* (KEP), fr. VII, *ro*; Sungei Sedili: *Ngadiman 36858* (K, SING) and *36867* (SING), fr. VII, *ro*; Singapore Isl., Bukit Mandi: *Langlassé 136* (G, P), fr. VIII, *ro*; Bukit Timah: *Ngadiman 37038* (KEP), fr. VI, *ro*; ibid.: *Ngadiman 37704* (K, SING), fr. V, *ro*; ibid.: *Ngadiman 34686, 36458* and *36484* (SING), *ro*; ibid.: *Sinclair s.n.* (L), young stage, *form doubtful*; Mandai road: *Liew 37743* (K, SING), fr. VIII, *ro*; Tanglin: *Ridley 6360a* (W), fr., *ro-cu.*

BANGKA. Lobok Besar: *Anta 844* (BO, L, SING) and *497* (BO, L), ♂ IX, *ro*; ibid., G. Pading: *Anta 988* (BO, L, SING), ♂ IX, *pa*; Perlang: *NIFS bb. 34083* (BO, L), ♂ IX, *ro*; ibid.: *NIFS bb. 34118* (BO, L), *pa.*

BORNEO. West Borneo, Melawi, Klepuk, B. Djantung: *NIFS bb. 29080* (L), ♂ VIII, *pa*; Melawi, B. Wata, Emang: *NIFS bb. 26861* (L), *pa*; Melawi, Bora, B. Guris: *NIFS bb. 29035* (L), *pa*; Brunei, B. Ratan: *Flemmich 48125* (KEP), fr. VII, *cu*; ibid.: *Flemmich 34438* (KEP), ♂ IV, *cu*; Ulu Belait: *Smith 30481* (KEP), fr. VIII, *ro*; B. Sawat: *Flemmich 34504* (KEP), young fr. V, *ro*; Berakas, Lambak: *Olds s.n.* (SING), ♂ and fr. V, *pu*; Labuan: *Apostol 44236 = S. H. 7684* (KEP, L, SING), fr. VII, *cu*; British North Borneo, Sandakan, Elopura, Kabili-Sepilok: *Enggoh 10551* (KEP, L), fr. VIII, *ro*; ibid.: *Matusop 41546 = S. H. 7429* (KEP, L, SING), fr. VII, *ro*; ibid.: *Puasa 7034* (K, SING), fr. III, *ro*; ibid., Kretam: *Ping Sam S. H. A 1878* (L), ♂ V, *cu*; Eastcoast: *Creagh s.n.* (K), young fr., *ro*; Tawau, Penayas: *Otik 5238* (SING), fr. VII, *ro*; South and East Borneo, Tidung c.a., Nunukan: *NIFS bb. 19784* (K, L), young fr. V, *ro*; Upper Mahakan, Lumpoko: *NIFS bb. 20662* (BO, L), *pa*; G. Sakumbang: *Korthals s.n.* (L, nr. 898.321—228), *ro, type* of *S. rostrata* Bl.; East Kutai: *NIFS bb. 14783* (L), *pa-cu*; ibid.: *NIFS bb. 15178* (L), *lectotype* of *forma pubescens* H. J. Lam; Balikpapan, Selimbung: *NIFS bb. 26379* (L, SING), *ro-pa*; ibid., S. Nikai: *NIFS bb. 25631* (L), *cu*; ibid., Pemaluan: *NIFS bb. 24737* (L), *pa*; Berouw, Betemu aer: *NIFS bb. 18928* (BO, L), *cu*; Tdg Bangko, near mouth of Mahakam river: *Kostermans 7127* (L), fr. VI, *pa*; ibid., *Kostermans 7113* (L), fr. V, *ro*; Loa Djanan, W. of Samarinda: *Kostermans 6526* (L), young fr. IV, *pa*; Pulu Laut & Tanah Bumbu, Seblimbingan: *NIFS bb. 31192* (L), *cu-pa*; Borneo, witthout loc.: *Korthals s.n.* (L, nr 897.363—270), *type* of *Drac. cuspidatum* Blume, cf. Remarks.

PHILIPPINES. Samar, Concord, Bagacay: *Sulit 6339* (L), *pa*; Mindanao, Surigao: *Ponce 22827* (K, US), fr. VIII, *cu*; Davao: *De Mesa 27463* (A, P, US), young fr. III—VI, *pa.*

Remarks: The type of *Dracontomelon cuspidatum* Bl. bears on one sheet the locality "Borneo" (897.263—270), on the other "Sumatra" (897.363—271). Probably both are from Sumatra, Palembang, collected by Praetorius and belonging to *Praetorius s.n.* (897.363—272), on the label of which the printed words "Borneo" and "Korthals" are scratched out and substituted by "Sumatra" and "Praetorius"; it is assumed that on the two other specimens application of the same procedure was neglected.

The petioles and petiolules are brown (*Corner s.n., Ngadiman 34686*). *Vernac. names*: simalang (Sum., Tapan.), mansipot (Langkawi Isl.), epic, dumar bekam (Mal. Penins., Kedah), rengas burung, r. putih (Bangka), kebayan burong, k. ayer (Brun.), salong banggi (Labuan), peninasan, piramuh, kumabang (Br. N. Born.), njihah (S. & E. Born.). *Flow. and fruit. times*: In Sum. fl. in II (Eastc.) and VII—VIII (Simalur, Palemb.), fr. in I—III (Palemb.). In Mal. Penins. fl. in IV (Perak, Malacca), fr. in IV—VIII. In Bangka fl. in IX. In Born. fl. in IV—V (Brun., Br. N. Born.), VII (Saraw.), X (S. & E. Born.), between X—III (Br. N. Born.), fr. in VII—VIII (Br. N. Born., Brun., Labuan), XII—II (Saraw.), III (Br. N. Born.). In Palawan fr. in IV. In Samar fl. in IV. In Mindanao fr. in VIII. In Celebes fr. in VI. *Uses*: fruits edible; wood used for planks, for paddy-pounders; resin used for making torches (Labuan).

15. D. floribunda (King) H. J. Lam, 1932a, 204 and 1932b, 357, fig. 16.

Misc. inform.: Henderson 1939, 39; Husson & Lam 1952a, 167.

Type specimen and basonym: *King's coll. 7510* (dupl. in L), *lectotype* of *Santiria floribunda* King, J. As. Soc. Beng. 62, 2, 1893, 254.

Distribution: Malay Peninsula (endemic).

MALAY PENINSULA. Perak, Larut, G. Pondok: *King's coll. 7510* (L), ♂ IV, *isotype* of *S. floribunda* King; ibid.: *Henderson 23800* (SING) young fr. VI; Ulu Sungei Kinta: *Sow 47268* (KEP), fr. VI; Kelantan, Lebir, *Browne 38485* (KEP).

Remarks: Leaves said to be used for atap (roofing).

16. D. elmeri H. J. Lam, 1932a, 203 and 1932b, 344, fig. 11.

Type specimen: *Elmer 21573* (L, dupl. in A, BISH, BM).

Distribution: one specimen collected in British North Borneo.

Tree, trunk 0.75 m in diameter. Branchlets rather thick, c. 1 cm, sulcate, densely minutely villose, medulla with many resiniferous ducts. Terminal bud densely pubescent, 1.5 cm long, 1 cm in diameter. *Leaves* 3½—4½-jugate; petioles strongly flattened at base, 9—14.5 cm long, 0.7—0.8 cm thick at base, puberulent and glabrescent, medulla with many resiniferous vascular bundles; interjugae 4.5—6 cm long; leaflets oblong, 12—22 cm long, 5—8.5 cm wide, base inaequilateral, acute or one half rounded, apex abruptly acuminate, petiolules 0.9—1.9 cm long, terminal ones 3.4—4.3 cm long, acumen 0.7—1.5 cm long, 0.15—0.25 cm wide; midrib prominent at either side, especially below; secondary nerves 13—18, not prominent above, prominent below, angle 60°—75°, curved, diminishing, archingly joined near margin in base and apex only; tertiary nerves transverse, prominent below, conspicuous above, as is the lax reticulation. *Inflorescences* and *flowers* unknown. *Infrutescences* puberulent, axillary, paniculate, 17—45 cm long, peduncle 0.7—2 cm long, 0.3—0.4 cm thick (descr. infrut. and peduncle, f. Lam). *Fruits* ovoid, glabrous, 4.1—4.7 cm long, 2—2.4 cm in diam., base rounded, apex subrounded, pericarp thin, putamen crustaceous, c. 0.05 cm thick, cotyledons palmatifid, contortuplicate; fruiting calyx 0.55—0.6 cm in diam., annular; fruit stalks 0.5—1.6 cm long, 0.3—0.45 cm thick.

BORNEO. British North Borneo, Tawao, prov. Elphinstone: *Elmer 21573* (A, BISH, BM, L), fr. X—III, *type*.

17. D. rubiginosa H. J. Lam, 1932a, 204 and 1932b, 361, fig. 18. — *Canarium rubiginosum* Bennett in Hooker f., Fl. Brit. Ind. 1, 1875, 535 (illeg. name), non *Canarium rubiginosum* (Blume) Miquel, Fl. Ned. Ind. 1, 2, 1859, 651.

Misc. inform.: Hildebrand 1949b, 1952a, b, c.

Type specimen: *Maingay 309* in K, dupl. in CAL and L.

Distribution: Malay Peninsula, Borneo (West Born., S. & E. Born.).

MALAY PENINSULA. Perak, Kinta: *D. F. O. 54680* and *54842* (KEP); Pahang, Kemansul: *Ahamed 40410* (KEP, L), young fr. X; Malacca, no loc.: *Maingay 309* (CAL, L), ♂ and fr., *isotypes*; Johore, North Kelunag: *Jalil bin Rahman 73001* (KEP).

BORNEO. West Borneo, Melawi, Watas Emang, near Betung: *NIFS bb. 26870* (L); Smitau, Na. Bungkung, B. Saguk: *NIFS bb. 32290* (A, L, SING), young fr. V; South and East Borneo, Berouw, Betemu aer: *NIFS bb. 18947* (A, BO, L); Loa Djanan, W. of Samarinda: *Kostermans 6384* (L), ♂ IV; Balikpapan, Sungei Wain: *Achmat bb. 34364* (L).

Remarks: This species is closely related to *D. incurvata*, the differences being the dense pubescence of branchlets, inflorescences and infrutescences, the pubescence of the lower side of the leaflets, and the broader and less slender infrutescences in *D. rubiginosa*.

The name *Canarium rubiginosum* Bennett being illegitimate, the author of the species is "H. J. Lam", not "(Bennett) H. J. Lam" (Int. Code of Bot. Nomencl. 1952, art. 81).

Habitat: at low altitudes, highest record 175 m (W. Born.).

Doubtful species.

18. Dacryodes? spec. — Husson & Lam 1952b, 168.

I did not see the specimen [*Clemens 1837* from North East New Guinea (A, B)], upon which Husson & Lam based their description.

IX. SANTIRIA Blume (and a new combination in PROTIUM).

Santiria Blume, Mus. bot. Lugd.-Bat. I, 14, 1850, 209; Lam 1932b, 367—404; Lam 1938, 126—157. — Type species: *S. oblongifolia* Blume — Distribution: About 23 species in tropical Africa and Asia.

Sectio SANTIRIA — *Eusantiria* Engler in DC, Mon. Phan. 4, 1883, 157; Lam 1932b, 368. — Distribution: 14 species in Sumatra, Malay Peninsula (1 end.), Bangka, Billiton, Borneo (5 end.), Luzon, Celebes, Morotai, Ceram and Ambon. — *Fig. 6.*

Sectio ICICOPSIS Bennett in Hooker f., Fl. Brit. Ind. I, 1875, 536 — *Trigonochlamys* Hooker f., Trans. Linn. Soc. 23, 1, 1860, 170 (as a genus); Lam 1932a, 206; Lam 1932b, 368 (as a section). — Type species: *S. rubiginosa* Blume — Distribution: 3 species in Sumatra, Malay Peninsula, Bangka, Billiton, Borneo and New Guinea. — *Fig. 6.*

Sectio SANTIRIOPSIS (Engler) H. J. Lam, 1932a, 204; Engler, Bot. Jahrb. 11, 1890, Beibl. 26, 6 (as a genus); Lam 1932b, 368. — Type species: *S. balsamifera* Oliver ex Engler — Distribution: About 6 species in tropical West Africa.

Key to the species of the sections Santiria and Icicopsis.

1a. Anthers basi- to dorsifix. — Tertiary nerves usually transversely reticulate; inflorescences pedunculate or branched from base; calyx sometimes deeply lobed, but usually with short lobes, sometimes more or less truncate; stamens inserted outside or on rim of disc, always 6; receptacle none; stigmatic scar on fruits from near apex to near base . . . . (Sectio **Santiria**) 2

b. Anthers adnate. — Tertiary nerves more or less longitudinally reticulate; inflorescences branched from base or with short peduncle; calyx-lobes nearly free; stamens inserted on margin of disc, 6 (*griffithii*) or 3 episepalous (*nana*, *rubiginosa*), sometimes with rudiments of epipetalous ones (*rubiginosa*); receptacle sometimes developed; stigma of fruits less than 90° excentric (Sectio **Icicopsis**) 23

2a. Lower side of adult leaflets densely woolly pubescent 3

b. Lower side of adult leaflets glabrous, or slightly pubescent on midrib or nerves only 9

3a. Petioles flattened or channeled at base; terminal bud long and narrow, (0.5—) 1—3 cm long 4

b. Petioles not or hardly flattened; terminal bud small, 0.3—1 cm long, narrow or broad 6

4a. Flowers (♀) 0.45 cm long, with deeply indented calyx, sepals 0.25—0.3 cm long; petals 0.3—0.35 cm long. — Petioles deeply channeled, rims of groove curved inward. — *Borneo* . . . . 1. **S. grandiflora** Kalkman

b. Flowers smaller, 0.2—0.4 cm long; calyx subtruncate, lobes not longer than 0.1 cm; petals 0.2—0.25 cm long. — Petioles sharply flattened or channeled . . . 5

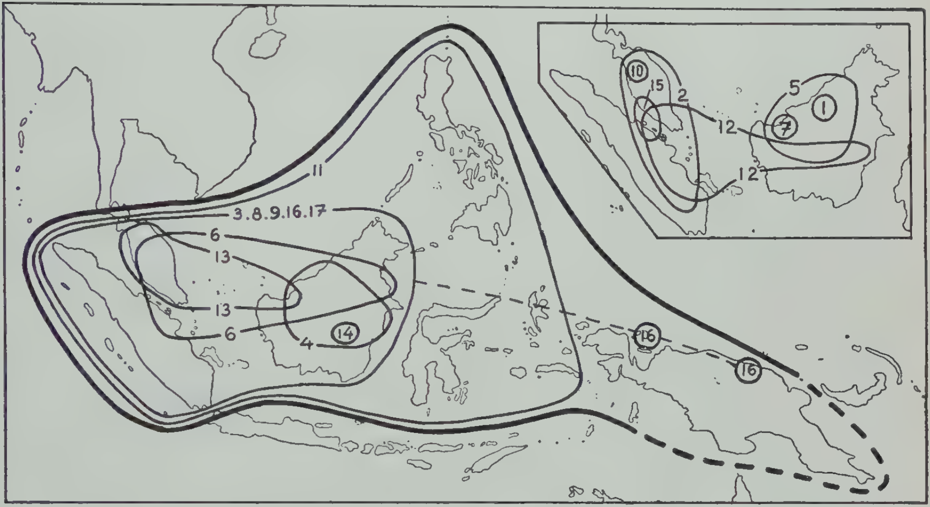

Fig. 6 — Distribution of the Malaysian species of *Santiria* — numbers refer to the number of the species in the present paper.

5a. Stigma of fruit very excentric, near pedicel. — Leaflets shining and with lax and very distinct reticulation on upper side, lower side densely ferruginously pubescent when young, hairs branched or fascicled, afterwards glabrate. — *Sumatra, Malay Peninsula* . . . . 2. **S. conferta** Bennett

b. Stigma of fruit slightly excentric, less than 90°. — Leaflets with minute, conspicuous but not prominent reticulation above, lower side densely woolly pubescent, hairs simple. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo* 3. **S. tomentosa** Blume

6a. Branchlets with many prominent, ferruginous lenticels and many resiniferous ducts in medulla; sepals nearly free, densely tomentose on either side, 0.15—0.25 cm long. — Petioles 5.5—8 cm long; leaflets oblong to ovate, 5.5—14.5 cm long, 3—4.5 cm wide; ♂ inflorescences (♀ ones unknown) lateral, conferted at tips of branchlets, up to 23 cm long. — *Borneo* . . . 4. **S. mollis** Engler

b. Branchlets without resiniferous ducts in medulla, lenticels not very prominent, not ferruginous; calyx truncate or subtruncate 7

7a. Stigma of fruit near pedicel; leaflets gradually narrowing into a relatively broad acumen. — Petioles 2.5—9.5 cm long; leaflets 7—19.5 cm long, 2.5—9.5 cm wide; inflorescences axillary, 5—20 cm long; ♂ flowers 0.25 cm long, glabrous but for some hairs on sepals and keel of petals; petals deltoid with narrowed base. — *Borneo* . . . . 5. **S. pilosa** Engler

b. Stigma of fruits less than 90° excentric; leaflets rather abruptly acuminate, acumen relatively narrow 8
8a. Branchlets 0.25—0.6 cm thick; leaves ½—2½-jugate; fruits oblong. — *Sumatra, Malay Peninsula, Borneo* . . . . **6. S. mollissima** Ridley
b. Branchlets 0.7—1.5 cm thick; leaves (2½—)3½—4½(—5½)-jugate; fruits irregularly globular or angular. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo*
3. S. tomentosa Blume
(For further differences between these two species, see under *S. mollissima*).
9a. Leaves very large, ca 135 cm long; petioles 26—35 cm long, ca 2.5 cm broad at base; leaflets elliptic, 25.5—46.5 cm long, 13.5—17.5 cm wide. — Infrutescences 30—38 cm long; fruits ovoid, 1.5—1.8 cm long, 1—1.2 cm in diam., stigma near pedicel. — *Borneo* . . . . **7. S. megaphylla** Kalkman
b. Leaves smaller; petioles rarely longer than 20 cm, up to 1.2 cm broad at base (unknown in *S. ridleyi*) 10
10a. Petioles not or hardly flattened at base 11
b. Petioles distinctly flattened or channeled at base 15
11a. Stigma of fruits up to 90° excentric 12
b. Stigma of fruits more than 90° excentric, often close to pedicel 13
12a. Leaflets reddish brown when dry; medulla of petioles without resiniferous ducts; tertiary nerves transverse to reticulate; fruits 1—1.5 cm long, 0.9—1.2 cm in diam. — Leaves 1½—3½-jugate; petioles 0.15—0.2 cm thick at base. — *Sumatra, Malay Peninsula, Borneo*
8. S. laevigata Blume (forma **glabrifolia** [Engler] H.J. Lam)
b. Leaflets yellowish brown or greyish when dry; medulla of petioles with some resiniferous ducts; tertiary nerves laxely reticulate to more or less parallel to secondary ones; fruits 1.5—2.2 cm long, 1.1—2 cm in diam. — Leaves (2½—) 3½—5½-jugate; petioles 0.25—0.4 cm thick at base. — *Sumatra, Malay Peninsula, Bangka, Borneo* . . . . **9. S. oblongifolia** Blume
13a. Petiolules 3—3.8 cm long. — Leaves ?—4½—?-jugate; leaflets rigid, oblong, 15—20 cm long, 6—7.5 cm wide; infrutescences ca 25 cm long; fruits angular-ovoid, 1.2—1.9 cm long, 1.1—1.5 cm in diam. — *Malay Peninsula*
10. S. ridleyi H. J. Lam
b. Petiolules 0.5—2 cm long 14
14a. Inflorescences 2—17.5 cm long, branched from base or with short peduncle. — Leaves ½—3½-(rarely 4½-) jugate; fruits 1—1.8 cm long, 0.7—1.3 cm in diam. — *Sumatra, Malay Peninsula, Borneo, Celebes, Philippines, Moluccas*
11. S. apiculata Bennett
b. Inflorescences 5—23 cm long, peduncle about half as long. — Leaves 2½—4½ (—5½)-jugate; fruits 1.2—1.4 cm long, 1.5—1.8 cm in diam. — *Borneo*
4. S. mollis Engler
15a. Tertiary nerves distinctly transverse 16
b. Tertiary nerves not distinctly transverse 18
16a. Inflorescences branched from base or peduncle up to 2 cm long; leaflets with very distinct reticulation above. — Fruits 1—1.3 cm long, 0.7—1.5 cm in diam., style rudiment more than 90° excentric; stamens inserted on or under rim of disc. — *Sumatra, Malay Peninsula* . . . . **2. S. conferta** Bennett
b. Peduncle 1.5—12.5 cm long; leaflets with conspicuous, but not prominent reticulation above 17
17a. Inflorescences 6.5—37 cm long; stamens inserted on or under rim of disc. — Fruits 1.2—2 cm long, (1—)1.4—1.8 cm in diam., style rudiment less than 90° excentric; leaflets usually darkbrown when dry. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Celebes* . . **8. S. laevigata** Blume (forma **laevigata**)
b. Inflorescences 1.5—5.5 cm long; stamens free around disc. — Fruits unknown; upper side of leaflets greyish green when dry, lower side light brown. — *Sumatra, Malay Peninsula, Bangka, Borneo* . . . . **12. S. nervosa** H. J. Lam
18a. Inflorescences 6.5—37 cm long; peduncle 1.5—12.5 cm long; style of fruits less than 90° excentric. — Leaflets (5—)12.5—26(—35.5) cm long, 2—8(—11) cm wide. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Celebes*
8. S. laevigata Blume (forma **laevigata**)
b. Inflorescences branched from the base or peduncle up to 3 cm long; style of fruits more than 90° excentric 19

19a. Inflorescences slender, rhachis at base not thicker than ca 0.2—0.3 cm . . 20

b. Inflorescences stout, rhachis more than 0.3 cm thick at base 21

20a. Petioles slightly flattened at base, 2—9 cm long; leaflets light-coloured when dry, greenish or brownish; flowers yellowish. — Leaflets ovate to elliptic, 5.5—16(—20) cm long, 2—6.5(—9) cm wide, chartaceous to submembranous; inflorescences and infrutescences 2—17.5 cm long, branched from base or with short peduncle; stamens inserted on outer side of disc; fruits 1—1.8 cm long, 0.7—1.3 cm in diam. — *Sumatra, Malay Peninsula, Borneo, Celebes, Philippines, Moluccas* . . . . **11. S. apiculata** Bennett

b. Petioles much flattened at base, 4.5—13.5 cm long; leaflets dark-coloured when dry, dark brown below, greyish or brown above; flowers red (also when dried and boiled in water). — Leaflets ovate to oblong, chartaceous to subcoriaceous; ♂ inflorescences 1.5—13 cm long, ♀ inflorescences and infrutescences 2—5.5 cm long, branched from very base; stamens inserted on or near rim of disc; fruits 0.6—0.9 cm long, 0.6—1 cm in diam. — *Malay Peninsula, Borneo*
13. S. rubra Ridley

21a. Reticulation distinct at either side of leaflets. — Lower side of leaflets pubescent when young, afterwards glabrous. — *Sumatra, Malay Peninsula*
2. S. conferta Bennett

b. Reticulation inconspicuous, especially on upper side of leaflets 22

22a. Infrutescences ca 25 cm long. — Leaflets oblong, 15—20 cm long, 6—7.5 cm wide; petiolules 3—4 cm long; secondary nerves 10—13; fruits angular-ovoid, 1.2—1.9 cm long, 1.1—1.5 cm in diam. — *Malay Peninsula* **10. S. ridleyi H. J. Lam**

b. Infrutescences 2.5—4.5 cm long. — Leaflets oblong to oblong-lanceolate, 10—16 cm long, 4.5—5 cm wide; petiolules 1.2—1.5 cm long; secondary nerves 8—11; fruits subglobose, 1.5—1.6 cm in diam. — *Borneo* . . . . **14. S. violacea H. J. Lam**

23a. Both sides of leaflets villous, especially at lower side and on nerves; tips of branchlets, petioles, rhachis, petiolules and inflorescences densely erect-pilose; leaflets 2—7.5 cm long, 1—3.5 cm wide; ♂ inflorescences axillary, 4—9 cm long; infrutescences 1—1.5 cm long. — *Sumatra, Malay Peninsula*
15. S. nana H. J. Lam

b. Leaflets glabrous, save sometimes a slight pubescence on midrib below; branchlets and petioles glabrous or pulverulent; leaflets 3—11(—17.5) cm long, 1—5.5(—7) cm wide; inflorescences up to 20 cm long 24

24a. Stamens 3, episepalous, sometimes with rudiments of 3 epipetalous ones; flowers small; sepals 0.1—0.25 cm long; petals 0.2—0.25 cm long. — Leaves 1½—5½(—6½)-jugate. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, New Guinea*
16. S. rubiginosa Blume

b. Stamens always 6; flowers relatively large; sepals 0.3—0.6 cm long in ♀ flowers, under the fruit up to 0.7 cm long, in ♂ flowers 0.3—0.45 cm long; petals in ♀ flowers 0.25—0.7 cm long, in ♂ flowers 0.35—0.5 cm. — Leaves (3½—)5½—10½-jugate. — *Sumatra, Malay Peninsula, Bangka, Borneo*
17. S. griffithii (Hooker f.) Engler

Sectio SANTIRIA

1. S. grandiflora nov. spec. — *Fig. 7.*

Type specimen: *Richards 1278* in L, dupl. in K, SING.

Distribution: one specimen collected in Borneo (Sarawak).

Tree. Branchlets terete, ca 1 cm thick, puberulent towards the tips, distinctly lenticellate, medulla without resiniferous ducts. Terminal bud acute, 2—3 cm long, pubescent. *Leaves* 4½—5½-jugate, lowest pairs of leaflets not strictly opposite; petioles deeply channeled at base, rims of the groove curved inward, 11.5—16.5 cm long, 0.5—0.8 cm broad at base, striate, puberulent, medulla with ca 12 resiniferous vascular bundles; interjugae 4.2—6.5 cm long; leaflets oblong or oblong-lanceolate, 11—27 cm long, 4.3—7.3 cm wide, base rounded, apex acuminate, acumen rather narrow, 0.6—1.5 cm long, petiolules 1.1—1.6 cm long, terminal ones 3—

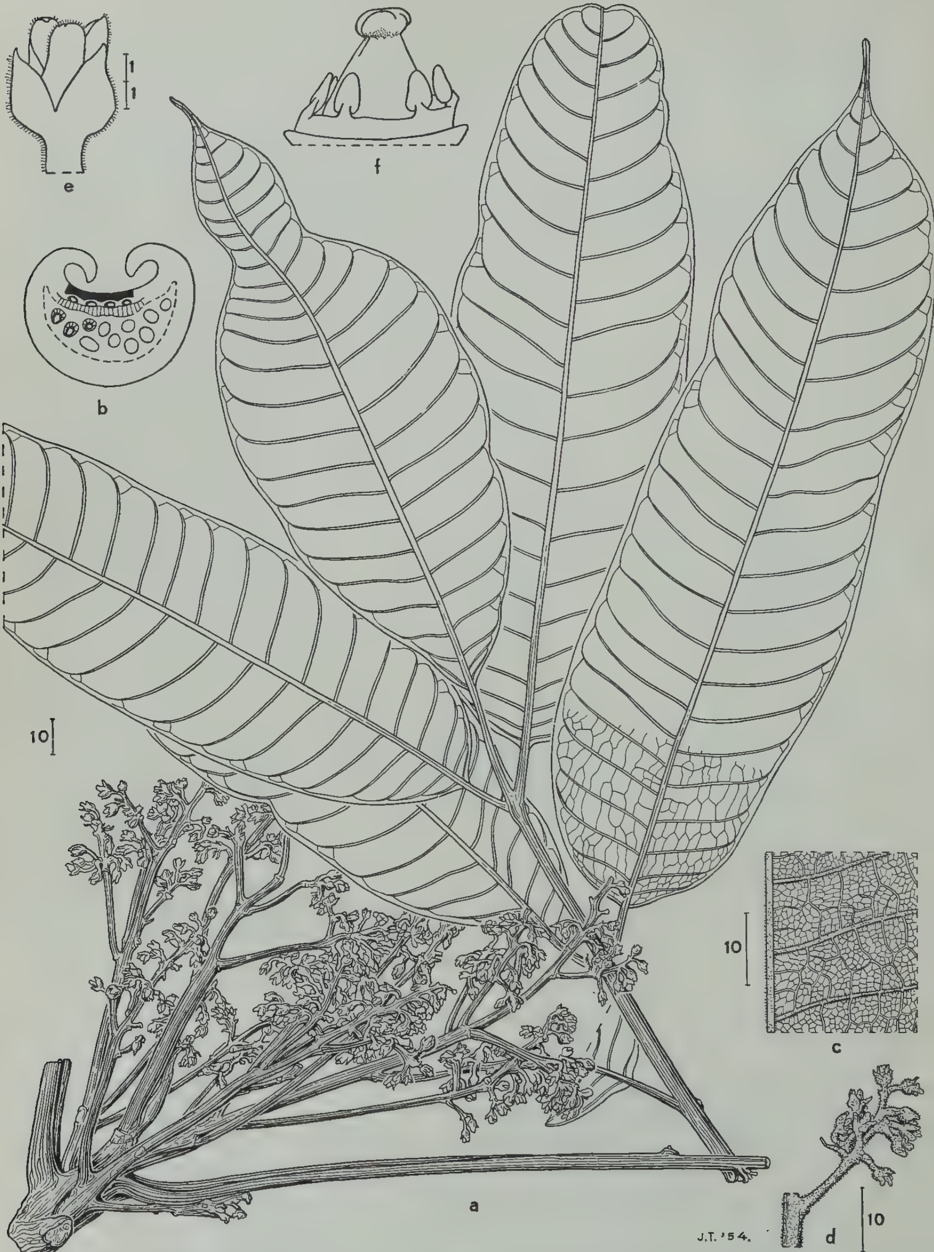

Fig. 7 — *Santiria grandiflora* Kalkman — a. branchlet with leaf and inflorescences; b. petiole, cross-section; c. detail leaflet, showing venation and indumentum; d. part of the ♀ inflorescence; e. ♀ flower; f. idem, calyx and corolla removed. — dimensions in mm — from the type.

3.7 cm long, leaflets glabrous above except the minutely pubescent base of the midrib, the lower side pubescent on nerves; midrib not prominent above, strongly prominent below; secondary nerves 15—24, hardly conspicuous above, prominent below, nearly straight up to near margin, then curved and often directly archingly joined, for the rest by strong tertiary nerves; tertiary nerves transverse, near midrib perpendicular to it, hardly conspicuous above, rather prominent below; reticulation not very conspicuous. *Inflorescences* (only ♀ ones known) paniculate, axillary, near tips of branchlets, 10—16 cm long, densely pubescent; peduncle 0.5—4.5 cm long; bracts deltoid, 0.2—0.3 cm wide, often persistent; bracteoles linear, 0.15—0.2 cm long. *Flowers* (only ♀ ones known) 0.45 cm long, 0.4 cm diam., pedicels densely pubescent, 0.15—0.3 cm long. *Calyx* deeply incised, lobes deltoid, acute, pubescent without, 0.3—0.35 cm wide, 0.25—0.3 cm long. *Petals* ovate, pubescent without, 0.3—0.35 cm long, 0.25—0.3 cm wide, with inflexed apiculum. *Stamens* 6, 0.075—0.1 cm long, filaments ca 0.025 cm long, inserted on rim of disc, anthers basifix, ca 0.05 cm long. *Disc* annular. *Ovary* ovate, glabrous, 0.2 cm long, 0.15 cm in diam., stigma sessile. *Infrutescences* and *fruits* unknown.

Descriptio typi: Arbor. Ramuli teretes, apicem versus puberuli, lenticellati, medulla aresinosa; alabastrum terminale acutum, 2—3 cm longum. *Folia* $4\frac{1}{2}$—$5\frac{1}{2}$-jugata; petioli sulcati, 11.5—16.5 cm longi, basi 0.5—0.8 cm lati, striati, puberuli, medulla circiter 12 fasciculis vasorum resiniferis suffulta; partes interjugales 4.2—6.5 cm longae; foliola oblonga vel oblongo-lanceolata, 11—27 cm longa, 4.3—7.3 cm lata, basi rotundata, apice tenuiter acuminata, petioluli laterales 1.1—1.6 cm longi, terminales 3—3.7 cm longus, costa media supra, basi excepta, glabra, subtus prominens; nervi secundarii 15—24, supra vix conspicui, subtus prominentes pubescentes, arcuatim conjuncti; nervi tertiarii transversi, supra vix conspicui, subtus subprominentes; reticulatione paulo conspicua. *Inflorescentiae* (♀) axillares, 10—16 cm longae, paniculatae, dense pubescentes; pedunculi 0.5—4.5 cm longi; bracteae deltoideae; bracteolae lineares. *Flores* (♀) 0.45 cm longi, 0.4 cm diametro, pedicelli dense pubescentes, 0.15—0.3 cm longi. *Calyx* profunde tripartita, lobi deltoidei, acuti, extus pubescentes. *Petala* ovata, extus pubescentia, 0.3—0.35 cm longa, 0.25—0.3 cm lata. *Stamina* 6, minuta, 0.075—0.1 cm longa, in disci margine inserta, antheris basifixis. *Discus* annularis. *Ovarium* glabrum, ovatum, stigmate sessili.

BORNEO. Sarawak, Mount Dulit (Ulu Tinjar), near Long Kapa: *Richards 1278* (K, L, SING), ♀ VIII, in primary forest on steep slope, alt. under 300 m, tree 27.5 m high, bark rather rough, dark red, soft, scaling in flakes, latex very copious, fruit said to be edible, *type*.

Remarks: Although no fruits are known, I consider this specimen belonging to *Santiria*, closely related to *S. laevigata* and *S. tomentosa*. It mainly differs in the following points:

	laevigata	*grandiflora*	*tomentosa*
petiole	sharply edged at base	deeply channeled, rims curved inward	slightly channeled or flattened and sharply edged
leaflets	glabrous	pubescent on midrib above and on nerves below	densely tomentose below and on midrib above
flowers	glabrous	pubescent	pubescent
calyx	subtruncate	deeply indented	shallowly cupular
petals	0.15—0.2 cm long	0.3—0.35 cm long	0.2—0.25 cm long

2. S. conferta Bennett in Hooker, Fl. Brit. Ind. 1, 1875, 537; Lam 1932b, 380, fig. 27 (incl. var. *wrayi* [King] H. J. Lam). — *Fig. 8* (♀ fl.).

Misc. inform.: Hildebrand 1949f, h.

Type specimen: *Griffith 1150* in K, dupl. in P.

Distribution: Sumatra (southern part), Malay Peninsula.

Descriptio aucta et emendata: Small to moderate-sized trees. Branchlets 0.6—1.5 cm thick, glabrous or pubescent, medulla without resiniferous ducts. Terminal bud long and narrow. *Leaves* 2½—7½-jugate; petioles strongly channeled at base, (4.5—)7.5—28.5 cm long, 0.3—1.2 cm broad at base, striate, pubescent or glabrous, medulla with many resiniferous vascular bundles; interjugae 2.5—8 cm long; leaflets ovate-oblong to lanceolate or oblong, (6.5—)8.5—26 cm long, 3.2—10 cm wide, base rounded, sometimes one half subacute, apex gradually and rather shortly acuminate, shining above and glabrous, lower side densely pubescent when young, afterwards glabrate, petiolules 1—2.5 cm long, terminal ones 2.5—7 cm long; midrib not or little prominent above, very prominent below; secondary nerves (9—)11—19, little prominent above, very prominent below, angle 60°—80°, nearly straight near midrib, then curved and especially at base and apex archingly joined; tertiary nerves laxely reticulate, conspicuous at both sides, at lower side sometimes inconspicuous by indumentum. *Inflorescences* lateral or axillary, pubescent to glabrous, panicles short, contracted, many-florous, 3.5—13 cm long, branched from the base or peduncle up to 2 cm long; pedicels pubescent. *Calyx* cupular, lobes deltoid, 0.15—0.2 cm wide, 0.05—0.075 cm long, pubescent without, glabrous within, as are petals. *Petals* elliptic to ovate, 0.2 cm long, 0.175—0.2 cm wide, with inflexed apiculum. *Stamens* monodynamous, inserted on or under rim on outer side of disc, in ♂ flowers 0.075—0.125 cm long, filaments 0.05—0.1 cm long, anthers ca 0.05 cm long, in ♀ flowers stamens 0.05—0.075 cm long, with very short filaments. *Disc* cupular. *Ovary* in ♀ flowers more or less circular, glabrous, with short thick style and 3-lobed stigma, in ♂ flowers the ovary only represented by a very small rudiment. *Infrutescences* pubescent, 4.5—19 cm long. *Fruits* 1—1.3 cm long, 0.7—1.5 cm in diam., style more than 135° excentric; fruiting calyx 0.25 cm in diam., pedicel 0.15—0.7 cm long; pericarp and putamen very thin.

SUMATRA. Riouw and Dependencies, Indragiri, Danau Mengkuang: *NIFS bb. 27518* (BO).

MALAY PENINSULA. Perak, Trolak: *Ja'amat & Tachun 43421* (KEP), ♂ II;

Larut: *King's coll. 3689* (L, US), fr. XII, *isotypes* of *Sant. wrayi* King; no loc.: *Scortechini 2095* (FI), fr.; Cameron Highland, Mengtigi: *Md ? Ali 34117* (KEP); Dindings, Bruas: *Unknown coll. 69405* (KEP), buds XI; Trengganu, Gunong Padang: *Moysey & Kiah 33934* (KEP), fr. VI; Selangor, Selangor Road: *Sabik 66202* (KEP); Klang: *Kehding 178* (FI), buds 1; Sungei Buloh Subang: *Ja'amat & Tachun 37984* (KEP), ♀ 1; Negri Sembilan, Sungei Mengala: *? Obid & Jidin 18414* (KEP), buds VIII; Johore, Kota Tinggi—Mawai Road: *Corner 28708* (BO, KEP), fr. II; Kulai: *Corner 29952* (BO), buds IX; Malay Peninsula, without loc.: *Griffith 1150* (P), ♂ & fr., *isotype* of *S. conferta* Benn.

Remarks: Lam (1932a, 205 and 1932b, 381) subdivides this species into two varieties, var. *typica* and var. *wrayi*, differing insofar as the latter is stouter and less pubescent than the former. It is, however, my impression, that the two types are to be found on the same tree and that these differences are only a matter of age.

Small to moderate-sized tree, 6—24 m high, with small buttresses and smooth, yellow-brownish and grey bark; resin pale and sticky, becoming black when older; wood fragrant (*Kehding 178*), the cut smells faintly of raspberries (*Ja'amat & Tachun 37984*). Flowers red, fruits white to blueish black. *Habitat*: In forests on level or hilly localities, at low altitudes, usually under 100 m alt., once from 240—300 m (Perak), once from 1150 m (Trengganu). *Vernac. names*: lalan (Sum., Riouw). *Flow. and fruit. times*: In Malay Penins. fl. in I—II (Per., Sel.) and VIII—IX (Per., Joh.), fr. in II—III (Joh., Sel.), in VI (Trengg.) and XII (Per.).

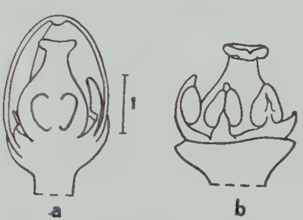

Fig. 8 — *Santiria conferta* Bennett — female flower, a. length section; b. androeceum and gynaeceum. — dimensions in mm — from *Ja'amat & Tachun 37984.*

3. **S. tomentosa** Blume, Mus. bot. Lugd.-Bat. 1, 14, 1850, 211; Lam 1932b, 391, fig. 33; Cretzoiu 1934, 265.

Misc. inform.: Heyne 1950, 881; Hildebrand 1949a, b, c, d, e, f, g, h, 1950a, 1952a, b, c, d, e; Sinia 1938, 69—102; Webber 1941, 441—465.

Type specimen: *Korthals (1168)*, (L, nr 898.321—245).

Distribution: Sumatra, Malay Peninsula, Bangka, Billiton (f. Lam), Borneo.

SUMATRA. Atjeh, Gajo Luëus, Gn Agosan: *NIFS bb. 22445* (L); Eastcoast, Kualu, Lundut concession, near Aek Kanopan: *Bartlett 6872* (US), ♂ III; Asahan, Masihi: *Krukoff 4051* (A, L, SING), young fr. X—XI; Lower Langkat, Alur Gusta: *NIFS bb. 16386* (L); Westcoast, Mentawei isl., P. Siberut: *NIFS bb. 17445* (L); ibid., Semararakocha (sic!), Saibi: *NIFS bb. 17481* (L); Riouw and Dependencies, Kuantan Districts, Muara Pantei: *NIFS bb. 23865* (L); Indragiri, Muara Serangge: *NIFS bb. 30061* (L); Palembang, Lematang Ilir, Gunung Megang: *NIFS bb. 32318* (L); ibid., Br Tjuban: *NIFS bb. 28746* (L); Sumatra, without loc.: *Korthals (1168)* (L, nr 898.321—245), fr., *type* of *S. tomentosa* Bl.

Malay Peninsula. Kedah, Kuah Muda, Bukit Singkup: *Din bin Hashim 59606* (KEP), fr. XII; Jeniang: *Syid Haron 20786* (KEP), young fr. VII; Perak, Kinta: *D. F. O. 54827* and *54830* (KEP); ibid., Tualang: *unknown coll. 63251* (KEP); ibid., Parit: *Tingan 54674* (KEP); Trengganu, Kemaman, Bukit Kajang: *Corner 30498* (KEP, L), ♂ XI; Selangor, Sungei Buloh: *Symington 29787* and *44703* and *Ja'amat 14950* (KEP); ibid., Subang: *Ja'amat & Tachun 37986* (KEP), fr. I; Pahang, Kamayan State land: *Mahamud 40303* (KEP), ♀ XI; Putat, *Baba 10773* (KEP); Johore, Mawai: *Ngadiman 34753* (KEP), fr. I; Pontian, Pengkalan Raja: *Ngadiman 36755* (KEP), buds VII; East Mersing, G. Arong: *Sulaiman bin Manja 74153* (KEP), ♂ X; Singapore, South side of Mac Ritchie Reservoir: *Sinclair s.n.* (L).

Bangka. Lobok Besar: *Anta 1129* (BO, L), fr. X; ibid.: *NIFS bb. 34174* = *Kostermans 240* (B, L), young fr. X; ibid.: *Anta 394* (BO, L), ♂ IX; ibid.: *Anta 530* (BO, L), ♀ & fr. IX; ibid., Bakung: *Anta 1070* (BO, L); ibid.: *NIFS bb. 34141* = *Kostermans 207* (BO, L); ibid., G. Mangkol: *Anta 823* (BO, L), fr. IX.

Borneo. West Borneo, Melawi, B. Ulu Bora Sepan: *NIFS bb. 29040* (L); Melawi, Tjatit, B. Gontuk: *NIFS bb. 27007* (L), fr. III; Sarawak, Dulit: *Richards 1399* (L), buds VIII; Hutan Merit: *Daud & Tachun 35703* (KEP), ♂ buds VIII; Praran: *E. S. M. 520* (KEP), ♂ buds VIII; Sipang, Sabu: *? Abdulmajio 64103* (KEP); British North Borneo, Sandakan, Tawan, Apaswustijn (sic!), Japanese track: *Simbut A 1633* (KEP), buds X; South and East Borneo, West Kutei, Mujup: *NIFS bb. 16882* (L); Loa Djanan, West of Samarinda: *Kostermans 6741* (L), ♂ IV; ibid.: *Kostermans 6408* (L), buds IV; Balikpapan, Sungei Wain: *Achmat bb. 34368* (L), *bb. 34399* (L), ♂ X, *Kostermans 4086* (L), ♂ X, *4401* (L), fr. X, *4516* (L), ♂ and fr. IX.

Remarks: For the relation to *S. mollissima* see under that species.

Mr Leenhouts, preparing his revision of *Canarium*, draws my attention to a new species of that genus, represented by the fruiting specimen *Beccari s.n.* from Celebes. When sterile, this species, although coming from outside the area of *Santiria tomentosa*, may cause some confusion, since on first sight it resembles the latter. The differences are:

Canarium spec.: Branchlets with prominent lenticels; terminal bud small, ca 0.6 cm long; petioles slightly flattened at base, medulla with some few resiniferous ducts; secondary nerves 10—17, angle with midrib 70° (at base)—50° (in apex).

S. tomentosa: Branchlets without such prominent lenticels; midrib 0.5—1.8 cm long; petioles sharply flattened or channeled at base, medulla with many resiniferous ducts; secondary nerves 15—26, angle with midrib 90° (at base)—70° (in apex); nervation as a whole less distinct at upper side of leaflets, especially secondary and tertiary nerves.

A tree, not higher than 30 m, twice reported with buttresses (Bangka, Borneo); bark greyish or brownish, flaking. Flowers green to yellow, fruits green, turning to greyish blue or blackbrown, sour. *Habitat*: forests, usually at low altitudes, up to 250 m, once from 475 m (W. Born.), once from 1800 m (Sum., Atj.). *Vernac. names*: ta-tahu (Mal. Penins., Pah.), kumbol mjior (Kedah), panggong (Selang.), asem-asem, ranggong, mengkabu (Bangka), kambaloh (Saraw.), kembajau (S. & E. Born.). *Flow. and fruit. times*: In Sum. fl. in III (Eastc.), VII and IX (Palemb.), fr. in VIII—XI (Palemb.). In Mal. Penins. fl. in VI—XI, fr. in VII (Per., Ked.), X (Per., Mal.), XII—I (Ked., Sel., Joh.). In Bangka fl. in IX, fr. in IX—X. In Born. flowerbuds in VII—X (Sar., Br. N. Born.), fr. in III (W. Born.).

4. S. mollis Engler in DC, Mon. Phan. 4, 1883, 156; Lam 1932a, 206 (excl. var. *sessilis* H. J. Lam, l. c.); Lam 1932b, 388, fig. 30. — *Fig. 9.*

Type specimen: *Beccari 3497*, dupl. in FI.

Distribution: Borneo (W.-Born., Sarawak, S. & E. Born.).

Additions to the description: ♂ *inflorescences* lateral, at tips of branchlets, 5—23 cm long, tomentose; peduncle about half as long. *Infrutescences* 9—19 cm long, with ferruginous lenticels, shortly tomentose up to the pedicels; peduncle 3.5—9 cm long. *Fruits* ± globose, 1.2—1.4 cm long, 1.5—1.8 cm in diam., style rudiment 90° or more excentric; pedicels 0.2—0.3 cm thick; calyx lobes deciduous; pericarp rather thin, putamen ca 0.05 cm thick, embryo unknown.

BORNEO. West Borneo, Melawi, Ng Betung, B. Bedjuwar: *NIFS bb. 26846* (L), buds I; Sarawak, Kuching: *Beccari 1215* (FI), buds XII; Matang: *Beccari 3497* (FI), ♂ II, *isotype* of *S. mollis* Engl.; South and East Borneo, Loa Djanan, W. of Samarinda: *Kostermans 6404* (L), buds IV, *6563* (L), fr. IV, *6728* (L), ♂ IV and *6753* (L), ♂ IV; Balikpapan, Sungei Wain: *Achmat bb. 34316* (L).

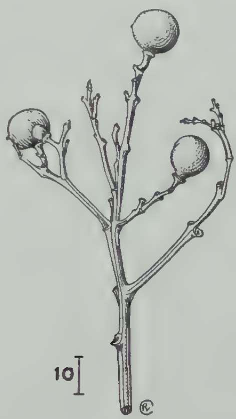

Fig. 9 — *Santiria mollis* Engler — part of the infrutescence — dimensions in mm — from *Kostermans 6563*.

Remarks: The specimens, recently collected by Kostermans, are much less tomentose as the type specimen and *Beccari 1215* are: branchlets and petioles of the former specimens are shortly tomentose to glabrous, leaflets are glabrous. Inflorescences and flowers are tomentose in all specimens known.

The filaments are not free from the disc — as stated in Lam, 1932b, 389 and fig. 30 — but connate with it.

Var. *sessilis* H. J. Lam, 1932a, 206, must be excluded, since it has proved to belong to *Parishia* (Anacard.); cf. note in Lam 1932a, 220.

Trees, 25—40 m high, buttressed. Bark yellowish brown, scaling off, lenticellate. Upper leaf-surface leadgreen (*Kostermans 6404*). Flowers white, fruits green. *Habitat*: Forests, at low altitudes, highest record 250 m (W. Born.). *Vernac. name*: kumbajau burung (S. & E. Born.). *Flow. & fruit. times*: Fl. in II—IV, fr. in IV.

5. S. pilosa Engler in DC, Mon. Phan. 4, 1883, 159; Lam 1932b, 389, fig. 31; Lam 1938, 139, 140.

Type specimen: *Beccari 2559* in P, dupl. in FI.

Distribution: Borneo.

BORNEO. Sarawak, Matang: *Beccari 2559* (FI), fr. IX, *isotype* of *S. pilosa* Engl.; Brunei, Pak Anduki: *Flemmich 34563* (KEP), young fr. V.

Remarks: Engler (in DC, Mon. Phan. 4, 1883, 158) mentions two specimens: *Beccari 2559* and *650*; the latter belongs, however, to *S. mollissima.*

The Brunei specimen deviates from the type by having more ovate leaflets with shorter acumen and less conspicuous tertiary nerves and reticulation above. I have placed it here mainly because of the infrutescences, the strongly excentric fruits and the anatomy of the petioles.

6. S. mollissima Ridley, Kew Bull. 1930, 85; Lam 1932b, 390, fig. 32.

Misc. inform.: Hildebrand 1952b, e.

Type specimen: *Haviland 1819* in BM, dupl. in SING, W.

Distribution: Sumatra (Riouw & Dep.), Malay Penins. (Penang, Selangor, Pahang), Borneo (Saraw., S. & E. Born. f. Lam).

SUMATRA. Riouw and Dependencies, Indragiri, Pagarumbei, Tjenako river: *NIFS bb. 25769* (L), fr. X.

MALAY PENINSULA. P. Penang, Waterfall Gardens: *Curtis s.n.* (SING), buds; Selangor, Klang, Kuala Langat: *Sudin 41754* (KEP); ibid., Telok: *Sinclair 40117* (L), ♂ XI; Pahang, Kuantan, Pekan road: *Ja'amat & Sow 43197* (KEP).

BORNEO. Sarawak, Kuching: *Haviland 1819* (BM, SING, W), ♂ & ♀ X, *type* of *S. mollissima* Ridl., see Remarks; ibid.: *Beccari 650* (FI), fr. IX, see Remarks; no loc.: *Native coll. 2708* (US), buds II—VI.

Remarks: The Vienna sheet of the type specimen has ♂ flowers, the Singapore sheet ♀ ones, the British Museum sheet has both. Possibly they come from the same tree, which would thus be monoecious, a rather unusual, though not entirely unknown, condition in Burseraceae.

The species is closely related to *S. tomentosa*, the differences being:

	mollissima:	*tomentosa:*
Branchlets	0.25—0.6 cm thick	0.7—1.5 cm thick
Terminal bud	0.3—0.6 cm long	0.5—1.8 cm long
Leaves	½—2½(—3½)-jugate	(2½—)3½—4½(—5½)-jugate
Petioles	(1.5—)3—7.7 cm long	6.5—24.5 cm long
Leaflets	elliptic, elliptic-oblong or ovate, 5.5—16.5 cm by 3—8 cm	oblong, elilptic-oblong or oblong-lanceolate, (6.5)—8—28(—34) cm by 2.5—9(—12.5) cm
Sec. nerves	(9—)11—15(—18)	(13—)15—26(—29)
Inflorescences	4—15(—20) cm long	6—38 cm long
Fruits	oblong, 1.1—1.5 cm long, 0.8—1 cm in diam.	irregularly globular or polygonous, 1.5—2.1 cm long, 1.4—2 cm in diam.

In all, *S. mollissima* makes a more slender impression than *S. tomentosa*. Sterile specimens with elliptic-oblong leaflets present sometimes difficulties in identification.

Beccari 650 was placed by Engler under *S. pilosa* (see there).

A tree, 15—18 m high. *Vernac. names*: terantai (Selang.), kedondong (Pahang). *Flow. and fruit. times*: In Sum. fr. in X. In Malay Penins. fr. in IV—V. In Sarawak fl. in X, fr. in IX and XII.

7. S. megaphylla nov. spec. — *Fig. 10.*

Type specimen: *Beccari 3059* in FI.

Distribution: one specimen collected in Sarawak.

Tree? Branchlets thick, ca 3 cm in diam., bark light greyish brown when dry, glabrous, lenticels conspicuous, circular to elliptic, medulla without resiniferous ducts; next to normal leaves there are undeveloped leaf-bases, 4—5 cm long, 0.5 cm wide, similar to those which serve as bracts to the inflorescences. Terminal bud ca 1.5 cm long, 1.2 cm in diam., densely tomentose. *Leaves* 5½-jugate (only one seen complete), perfectly glabrous, very large, ca 135 cm long; petioles 26—35 cm long, ca 2.5 cm broad at base, channeled and somewhat auriculate at base, striate, with many elliptic lenticels; interjugae 9.5—12 cm long, medulla with many circumvasal resiniferous vascular bundles; leaflets elliptic, elliptic-ovate or elliptic-oblong, 25.5—46.5 cm long, 13.5—17.5 cm wide, base rounded to broadly acute, apex relatively shortly acuminate, acumen blunt, 0.5—1.3 cm long, leaflets shiningly brown at either side when dry, coriaceous, petiolules 2.2—3.8 cm long, 0.3—0.4 cm thick, lowest ones shortest, terminal ones 10 cm long; midrib prominent at both sides, as are the secondary nerves; secondary nerves 8—14, angle 60°—70°, not directly archingly joined except sometimes in base and apex; tertiary nerves prominent below, conspicuous above, laxely reticulate. *Inflorescences* and *flowers* unknown. *Infrutescences* conferted at tips of branchlets, paniculate, 30—38 cm long, shortly pubescent, striate, peduncle 4.5—9 cm long, bracts subulate, 1.5—2 cm long, 0.5—0.7 cm wide, bracts of lower order semicircular to deltoid, persistent, ca 0.2 cm wide at base. *Fruits* ovoid, 1.5—1.8 cm long, 1—1.2 cm in diam., faintly wrinkled when dry, stigma very excentric, near the pedicel, pericarp and putamen thin, cotyledons palmatifid; fruiting pedicel 0.1—0.3 cm long, 0.15—0.2 cm thick, pubescent; fruiting calyx 0.3 cm in diam., glabrous, disc cupular, rudiments of the 6 stamens inserted on its outer side.

Descriptio typi: Arbor? Ramuli 3 cm crassi, glabri, lenticellati, medulla aresinosa; alabastra terminalia tomentosa, 1.5 cm longa, 1.2 cm diam. *Folia* 5½-jugata, glabra, ca 135 cm longa; petioli 26—35 cm longi, basi 2.5 cm crassi, sulcati et plusminusve auriculati, striati, lenticellati; rhachidis partes interjugales 9.5—12 cm longae, medulla multis fasciculis vasorum resiniferis suffulta; foliola coriacea, elliptica, elliptico-ovata vel elliptico-oblonga, 25.5—46.5 cm longa, 13.5—17.5 cm lata, basi rotundata vel late acuta, apice breviter acuminata, petioluli laterales 2.2—3.8 cm longi, 0.3—0.4 cm crassi, terminales 10 cm longi, acumine 0.5—1.3 cm longo, obtuso; costa media et nervi secundarii prominentes; nervi secundarii 8—14, angulo 60°—70° de costa adscendentes, basi et apice exceptis haud arcuatim conjuncti; nervi tertiarii reticulati, reticulatione laxa subtus prominentes, supra conspicui. *Inflorescentiae floresque* ignoti. *Infrutescentiae* paniculatae, 30—38 cm longae, pubescentes, striatae, pedunculo 4.5—9 cm longo, bracteae subulatae. *Fructus* ovatus, 1.5—1.8 cm longus, 1—1.2 cm diam., styli rudimento valde excentrico; pedicelli 0.1—0.3 cm longi, 0.15—

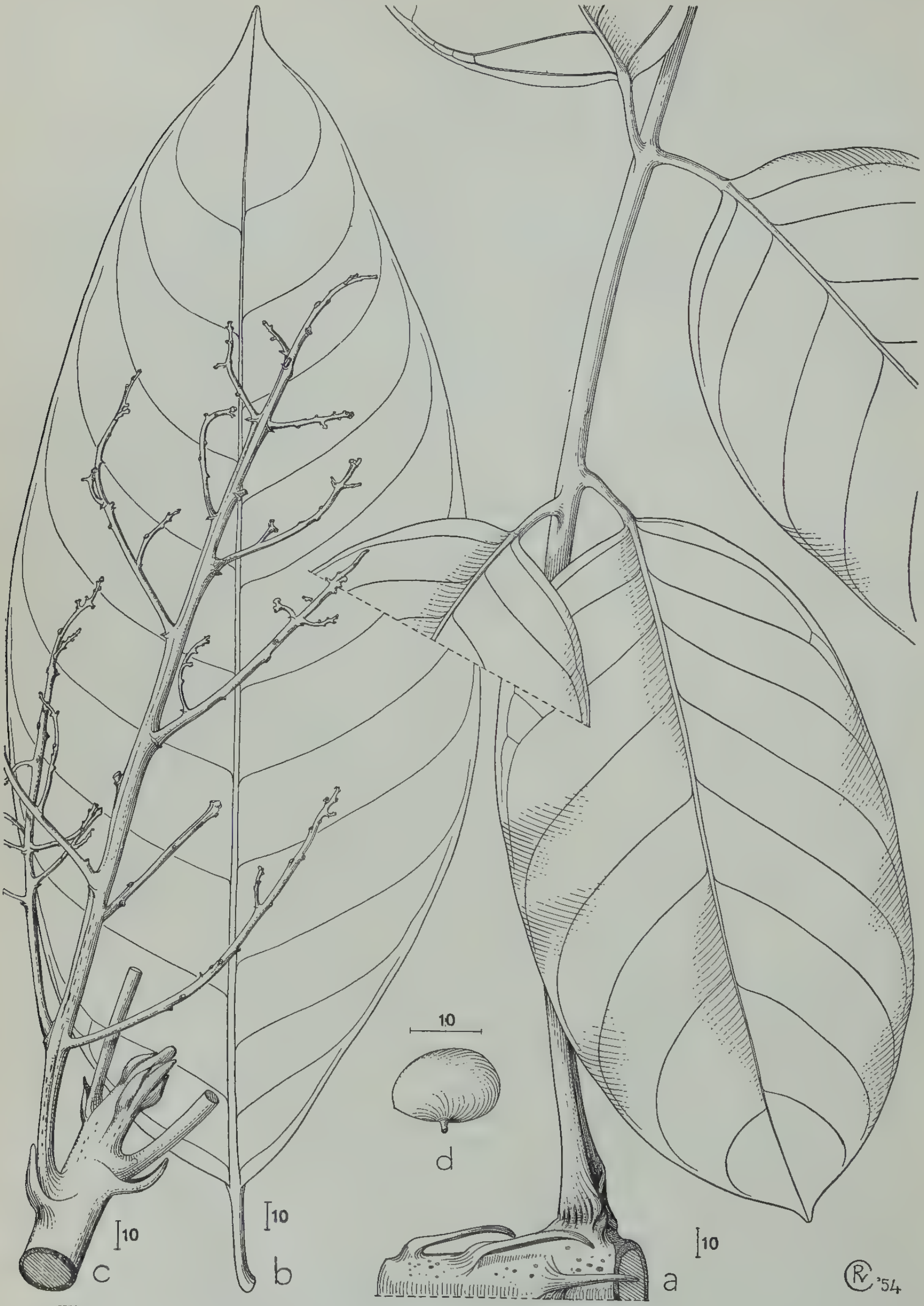

Fig. 10 — *Santiria megaphylla* Kalkman — a. lower part of a leaf; b. leaflet from the central part of a leaf; c. infrutescence, fruits detached; d. fruit. — dimensions in mm — from the type.

0.2 cm crassi, pubescentes; calyx fructiger 0.3 cm diam., glaber, discus cupuliformis, staminum rudimentis 6 extus discum insertis.

Borneo. Sarawak, Gunong Sidgingdgiang (Italian transcription): *Beccari 3059* (FI), fr. I, *type*.

8. S. laevigata Blume, Mus. bot. Lugd.-Bat. 1, 14, 1850, 211; Lam 1932b, 382, fig. 28; Cretzoiu 1934, 265; Lam 1938, 145; Lam 1945, 610, 630.

Misc. inform.: Heyne 1950, 881; Hildebrand 1949a, b, d, e, f, g, h, i, 1950a, b, c, 1952a, b, c, d, e; Sinia 1938, 69—102; Webber 1941, 441—465.

Type specimen: *Korthals s.n.* (L, nr 898.321—201).

Distribution: Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Central Celebes.

I here distinguish two formae (indicated in the list by *lae* and *gl* respectively), the differences of which are as follows:

Forma **laevigata** — *S. laevigata* Bl. var. *applanata Blume*, l. c. — *S. laevigata* Bl. forma *typica* H. J. Lam, 1932a, 205 and 1932b, 384 — *S. laevigata* Bl. forma *rufescens* (Bl.) H. J. Lam, 1932a, 205 and 1932b, 384. — Branchlets stout to rather stout, 0.45—1.1 cm thick, medulla usually without, rarely with 7—20 resiniferous ducts, sometimes sclerenchymatic. *Leaves* 2½—5½-jugate; petioles channeled or at least sharply flattened at base, rarely nearly terete, 4.5—18(—22.5) cm long, (0.15—)0.3—0.8 cm wide at base; leaflets large to rather large, (5—)12.5—26(—35.5) cm long, 2—8(—11) cm wide, oblong to elliptic; midrib prominent below, reticulation usually not very conspicuous below, less conspicuous than the tertiary nerves. *Inflorescences* 6.5—37 cm long, ♀ ones smaller than ♂ ones. *Fruits* 1.2—2 cm long, (1—)1.4—1.8 cm in diam. — *Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, Central Celebes.*

Forma **glabrifolia** (Engler) H. J. Lam, 1932a, 205 and 1932b, 384. — Branchlets slender, 0.3—0.6 cm thick, medulla without resiniferous ducts, usually sclerenchymatic. *Leaves* 1½—3½-jugate; petioles terete or hardly flattened, 3—8.5(—11) cm long, 0.15—0.2 cm wide at base; leaflets small, (4.5—)6—15.5 cm long, 2.5—7 cm wide, ovate to elliptic; midrib not prominent below, reticulation conspicuous below, as conspicuous as tertiary nerves. *Inflorescences* 4—27 cm long. *Fruits* 1—1.4 cm long, 0.9—1.2 cm in diam. — *Sumatra, Malay Peninsula, Borneo.*

The types of *S. rufescens* Blume and *S. laevigata* Blume var. *applanata* Blume (especially the latter) seem to be transitional between the two forms as described above, rather than representing a separate form, as was accepted by Lam. The greater part of the specimens, identified by Lam as forma *rufescens*, in my opinion belong to forma *laevigata*.

Sumatra. Eastcoast, Asahan, Masihi: *Krukoff 4229* (BO, L), buds X—XI, *lae*; ibid., Lumban Ria: *Rahmat Si Buea 8036* (US), buds II—IV, *lae*; Tapanuli, Angkola & Sipirok, Panobasan: *NIFS bb. 26387* (L), fr. XI, *lae*; Sibolga c. a., Barus, Sambung: *NIFS bb. 29571* (L), *lae*; Westcoast, Bangkinang, Katur: *NIFS bb. 23397* (L), *lae*; Sariaman, Salibutan, Lb Alung: *NIFS bb. 19616* (BO, L), *lae*; Padang, Lb Minturun: *NIFS bb. 17697 & bb. 17698* (L), *lae*; Riouw and Dependencies, Kuantan Districts, Sungei Besar: *NIFS bb. 24030 & bb. 24038* (L), *lae*; ibid., Djake: *NIFS bb. 26468* (L), young fr. XII, *lae*; ibid., Pulau Kedondong: *NIFS bb. 24794* (L), *lae*; ibid., Tjerenti: *NIFS bb. 25217* (L), *lae*; Indragiri, Belimbing: *NIFS bb. 28469* (L), young fr. VI, *lae*; ibid., Kw. Keritang: *NIFS bb. 28706* (BO), ♂ VIII, *gl*; Benkulu, Redjang, Tebat Monok: *NIFS bb. 31054* (L), fr. XII, *lae*; Palembang, Lematang Ilir, Semangus: *NIFS bb. 31938, bb. 32160* & *bb. 32195* (L), *lae*; ibid., Gunung Megang: *NIFS bb. 31560* (L), *bb. 31561* (BO) & *bb. 31562* (BO), *lae*; ibid.: *NIFS bb. 32316* (L), ♂ VIII, *lae*; no loc.: *Praetorius s.n.* (L, nr 898.321—230), *lae, type* of *S. rufescens* Bl.; Sumatra, without loc.: *Korthals s.n.* (L, nr 898.321—201), fr., *type* of *S. laevigata* Bl.; ibid.: *Praetorius s.n.* (L, nr 898.321—207), ♂, *lae, type* of *S. laevigata* var. *applanata* Bl.

Malay Peninsula. Kedah, Kulim, Inas: *Syed Hasan 55773* (KEP), ♀ IX, *lae*; Sik, Telai, Batu Besar: *Salleh bin Yusoff 60475* (KEP), *lae*; Perangin: *Awang 42385* (KEP), *lae*; Bongsu, Bukit Bintang: *Yunus 50001* (KEP), *lae*; Muyol: *Mch 42288* (KEP), fr. XI, *lae*; K. Muda, Sungkop: *Ali 73791* (KEP), fr. III, *lae*; Perak, Trolak: *Browne 43451* & *43615* (KEP), *lae*; Kroh: *Luwee 28601* (KEP), fr. III, *lae*; Plus: *Suoh 16769* (KEP), *lae*; Kinta, Gopeng: *King's coll. 4438* (L), fr. VI, *lae*; no loc.: *Scortechini s.n.* (FI), fr., *lae*; Kelantan, Nibong: *Nik Yusoff Omar 65206* (KEP), *lae*; Trengganu, Kemaman, Bukit Kajang: *Corner 30334* (KEP), ♀ XI, *lae*; ibid.: *Corner 30474* (KEP), ♂ XI, *lae*; Selangor, Subang, Sungei Buloh: *Walton 29733* (KEP), fr. III, *lae*; ibid.: *Ja'amat & Tachun 37989* (KEP), *lae*; ibid.: *Sidik 44906* (KEP), *lae*; ibid.: *Saris 39765* (KEP), *lae*; Kajang, Bangi, Dinkil State Land: *Osman & Tachun 23661* (KEP), fr. XII, *lae*; Klang: *Kehding 21* (FI), fr.XII, *lae*; ibid., Bukit Cheraka: *D.F.O. 18711* & *38182* (KEP), *lae*; ibid.: *unknown coll. 66214* (KEP), *lae*; ibid., Channgang: *Mohd Nur 34010* (L), ♀ & fr. X, *gl*; Batang Berjuntai: *Osman & Sow 28300* (KEP), ♀ & fr. XII, *gl*; Rawang: *Ngah 32312* (KEP), *lae*; ibid., Rantau Panjang: *Ngah 32302* (KEP), *lae*; ibid.: *Jusus 28940* (KEP), *lae*; Batu Arang, Bukit Djok: *Jusus 28945* (KEP), *lae*; Pahang, Putat: *Baba 31504* & *31508* (KEP), *lae*; Raka: *Zin 27538* (KEP), *lae*; Gunong Tahan: *Woolley 8234* (KEP), *lae*; Negri Sembilan, Port Dickson: *Sow-Lindong 66518* (KEP), fr. XII, *lae*; ibid., Cape Rachado: *Wyatt-Smith 71342* (KEP), *lae*; Johore, Sungai Sedili: *Ngadiman 36864* (KEP), young fr. VII, *lae*; ibid., below Mawai: *Corner 36804* (KEP), young fr. VII, *lae*; ibid., Bukit Naga Mengulor: *Ngadiman 36895* (KEP), fr. VII, *lae*; Mawai: *Ngadiman 36798* (KEP), ♂ VII, *gl*; Kulai: *Corner 29957* (BO, KEP), buds IX, *lae*; Pontian: *Yasmi bin Atoo 70904* (KEP), fr. II, *lae*; ibid.: *Bidin bin Samad 70259* (KEP), *gl*; ibid., Pengkalan Raja: *Ngadiman 36648* (KEP), fr. VI, *gl*; Singapore, Bukit Timah: *Ngadiman 34772* (KEP, L), young fr. VIII, *lae*; ibid.: *Ngadiman 36130* (KEP), fr. IX, *lae*; Turong: *Corner 26046* (KEP), fr. XII, *gl*; Garden Jungle: *Ridley s.n.* (BM), fr., *lae*; Malay Peninsula, without loc.: *unknown coll. 16338* (KEP), fr., *lae*.

Bangka. Lobok Besar: *Anta 284* (BO, L), ♂ IX, *lae*; ibid.: *Anta 185* and *NIFS bb. 33964* = *Kostermans 26* (BO, L), ♂ VIII, *lae*; ibid.: *Anta 825* and *NIFS bb. 34076* = *Kostermans 139* (BO, L), young fr. IX, *lae*; ibid.: *NIFS bb. 34213* (BO, L), *lae*.

Borneo. West Borneo, Melawi Tjatit B. Bansa: *NIFS bb. 26032* (L), *lae*; Sarawak, Boards of Bintulu: *Beccari 3756* (FI), ♀ IX, *isotype* of *S. glabrifolia* Engler; Brunei, Seria: *Flemmich 32632* (KEP, L), fr. III, *gl*; ibid.: *Flemmich 37198* (KEP), fr. II, *lae*; ibid.: *Flemmich 48224* (KEP), ♂ XI, *gl*; ibid., Badas road: *Abot & Suhaig 37138* (KEP), fr. II, *gl*; British North Borneo, Sandakan, Kabili-Sepilok: *Keith 4682* (L), fr. V, *lae*; Mount Kinabalu, Penibukan: *Clemens s.n.* (B, L), fr. I, *lae*; South and East Borneo, West Kutai, Kahala: *NIFS bb. 28369* (BO), young fr. VII, *lae*; ibid., Mujup: *NIFS bb. 16737* (BO), *gl*; ibid.: *NIFS bb. 16884* (L), *lae*; Sampit: *Buwalda 7754* (BO, L), *7755* (BO, L) & *7834* (BO), ♂ IX, *gl*; ibid.: *NIFS bb. 32402* = *Buwalda 25* (BO, L), *gl*; Tidung Districts, Tanah Merah: *NIFS bb. 18235* (BO), *gl*; Upper Mahakam, D. Parei: *NIFS bb. 20729* (BO) & *bb. 20742* (BO, L), *lae*; Loa Djanan, W. of Samarinda: *Kostermans 6694* (L), fr. IV, *lae*; Balikpapan, Sungei Wain: *Achmat bb. 34318* (L), *lae*; ibid.: *Kostermans 4059* (L), buds X, *gl*, and *4350* (L), young fr. X, *lae*; ibid., Muan region near Sungei Riko: *Kostermans 4363* (L), young fr. XI, *lae*; Borneo, without loc.: *Hallier 3125* (L), *lae*, see Remarks.

Celebes. Malili, Usu: *NIFS bb. 32470* (BO, L), *lae*; ibid.: *NIFS* Cel/II-216 (BO), fr. I, *lae*; ibid., Margosuko: *NIFS bb. 32451* (BO, L), ♂ IX, *lae*; ibid., Lawoli: *NIFS bb. 23252* (L), *lae*.

Remarks: Lam (1932b, 386) mentions *Hallier 2125* from Borneo; this is probably a printing-error for *3125*.

A tree, usually not higher than 30 m, rarely up to 45 m. Buttresses often recorded. Bark flaking, greyish to brownish, with little to much sap of various colours: colourless, white, yellow, red, black. The wood has a strong, aromatic smell (*Wyatt-Smith 71312*). Flowers fragrant, green to white with brown stamens; fruits green when young, turning yellow and red, finally black. *Habitat*: Forest, from low altitudes up to 1200—1500 m. Forma *glabrifolia* has repeatedly been collected in peat forests, forma *laevigata* usually in dry, rarely in swampy localities. *Vernac. names*: amparah (Sum., Palemb.), kaju kalas (Eastc.), katuko lagau (Westc.), kumbooi nyior (Mal. Penins., Kedah), panjong bruang (Sel.), ranggung, gerunggang (Bangka), pusan, pasan, merasam, gandis, merambang (S. & E. Born.), bakata pute (Cel.). *Flow. and fruit. times*: In Sum. fl. in IV, VI, VIII—IX, XI, I, fr. in VI, VIII, XI—III. In Mal. Penins. fl. in VII—XII, fr. in VI—IV. In Bangka fl. in VIII—IX. In Born. fl. in VIII—XI, fr. in VII—II. In Cel. fl. in IX, fr. in I. *Uses*: Fruits are edible, according to several collectors. The wood is used for posts and planks (Sum., Westc.) and for parang (chopping knife)-handles (Mal. Penins., Sel.).

9. **S. oblongifolia** Blume, Mus. bot. Lugd.-Bat. 1, 14, 1850, 211; Lam 1932b, 372, fig. 22); Cretzoiu 1934, 265.

Misc. inform.: Hildebrand 1949a, e, f, h, i, 1950a, b, c, 1952a, c, d, e; Sinia 1938, 69—102; Webber 1941, 441—465.

Type specimen: *Praetorius s.n.* (L, nr 898.321—221).

Distribution: Sumatra, Malay Peninsula, Bangka, Borneo.

SUMATRA. Eastcoast, Asahan, Masihi: *Krukoff 4219* (BO, L), fr. X—XI; Tapanuli, Sibolga, Sihorbo: *NIFS bb. 26564* (L); Riouw and Dependencies, Indragiri, Danau Mengkuang: *Buwalda 6624* (BO, L), fr. IV; ibid.: *NIFS bb. 27495* (L), fr. IV; ibid., Kwala Belilas: *NIFS bb. 27617* (L); Palembang, Lematang Ilir, Semangus: *NIFS bb. 31693* (L), buds IV; ibid.: *NIFS bb. 32134* (L), ♂ VI; ibid.: *NIFS bb. 32001* (L), *bb. 32047* (L), *bb. 32210* (L), *bb. 32220* (BO), *bb. 32228* (BO) & *bb. 32238* (BO); ibid., near Muara Enim: *Buwalda 7629* (BO, L), buds IV; Sumatra, without loc.: *Praetorius s.n.* (L, nr 898.321—221), ♂, *type* of *S. oblongifolia* Bl., see Remarks.

MALAY PENINSULA. Kedah, Bongsu: *Abdullah 33049* (KEP), fr. VIII; Selangor, Sungei Buloh: *Sidik 44907* (KEP); Pahang, Kuantan, Bukit Beserah: *unknown coll. (illegible) 65682* (KEP); ibid., Kembar Ulu Endau: *Awang 17280* (KEP); Negri Sembilan, Sungei Mengala: *Wyatt-Smith 64094* (KEP); ibid.: *?Obid & Jidin 18414* (KEP), buds VIII; Johore, Pontian: *Mustapha bin Sideh 69807* (KEP).

BANGKA. Lobok Besar: *NIFS bb. 34127* = *Kostermans 193* (BO, L).

BORNEO. British North Borneo, Sandakan, Sepitang, Seungau: *Cuadra A 3295* (KEP, L, SING), ♂ VI; Lumat, Beaufort: *Cuadra A 1300* (KEP, L); South and East Borneo, Hayup; *Winkler 2478* (L), ♂; East Kutai, Sangkulirang, Sungei Susuk region: *Kostermans 5526* (L), ♂ VI; N. of Balikpapan, Sg. Wain region: *Kostermans 4314* (L), young fr. X; Borneo, without loc.: *Müller s.n.* (L), ♂.

Remarks: In the Rijksherbarium there are four specimens, probably representing isotypes; two of them (L, nrs 898.321—219 and —220) bear the name of Korthals, of the two others the collector is not mentioned. The first of these is from Sumatra (L, nr 898.321—223, ♂ & fr.), the second one gives Java as place of origin (L, nr 925.250—479, ♂ & fr.), but this must be a mystification. Hildebrand does not mention the species from Java.

A tree, up to 30 m, rarely higher, without or with small buttresses; flowers green to yellowish, fruits green, turning blue when ripe. *Habitat*: Forest, preferably at low altitudes, under 300 m, some records from ca 1500 m. *Vernac. names*: lalan (Sum., Riouw & Dep.), kedongdong pergam, kabu-kabu (Sum., Palemb.), kedondong (Mal. Penins.). *Flow. and fruit. times*: In Mal. Penins. fl. in VI (Per.), fr. in VIII (Ked.) and I—II (Per.). In Sum. fl. in V—VIII, fr. in X—XI (Eastc.) and IV (Riouw & Dep.). In Born. fl. in VI—VII (Br. N. Born., S. & E. Born.), X (S. & E. Born.), fr. in VII, X, XII (S. & E. Born.).

10. S. ridleyi H. J. Lam, 1932a, 205 and 1932b, 379, fig. 25.

Type specimen: *Ridley 9653* in K, dupl. in SING.

Distribution: one specimen collected in the Malay Peninsula (Perak).

Small tree, branchlets unknown. *Leaves* ca 4½-jugate, glabrous; petioles unknown; interjugae terete, ?—7—8 cm long, medulla with some resiniferous ducts; leaflets subcoriaceous, not always strictly opposite, oblong, 15—20 cm long, 6—7.5 cm wide, base subrotundate, apex more or less abruptly acuminate, petiolules 3—3.8 cm long, terminal ones unknown; midrib not prominent above, strongly prominent below; secondary nerves 10—13, hardly conspicuous above, prominent below, straight or curved, irregular, angle 60°—80°, soon diminishing, not or inconspicuously joined; tertiary nerves laxely reticulate, inconspicuous. *Inflorescences* and *flowers* unknown. *Infrutescences* (detached ones) glabrous, broadly paniculate, strongly angular, branched from base, up to 23 cm long, lowest ramifications up to 17 cm long. Pedicels 0.5—0.7 cm long. Fruiting calyx cupular or infundibuliform, 0.35 cm in diam., with acute triangular lobes; disc spreading; stamens inserted outside the disc or at base faintly connate with it. *Fruits* angular-ovoid, 1.2—1.9 cm long, 1.1—1.5 cm in diam., style strongly excentric; pericarp and putamen rather thin, embryo unknown.

Malay Peninsula. Perak, Gunong Keledang: *Ridley 9653* (SING), fr. and young fr. IX, *isotype* of *S. ridleyi* H. J. Lam.

Remarks: This incompletely known species resembles in many respects *S. oblongifolia* and I should certainly have identified the specimen as such, were it not for the fruits: in *S. ridleyi* the stigma is much more excentric than in *oblongifolia.*

11. S. apiculata Bennett in Hooker, Fl. Brit. Ind. 1, 1875, 537; Lam 1932b, 375, fig. 23; Cretzoiu 1934, 265; Lam 1938, 126—157; Lam 1945, 611. — *Canarium spec.* Merrill 1916, 278.

Misc. inform.: Heyne 1950, 881; Hildebrand 1949h, 1950a, b; Sinia 1938, 69—102; Webber 1941, 441—465.

Type specimen: *Maingay 303* (*lectotype*) in K, dupl. in L.

Distribution: Sumatra, Malay Peninsula, Borneo, Central and South Celebes, Philippines (Luzon), Moluccas (Morotai, Ambon, Ceram).

Sumatra. Eastcoast, Asahan, Masihi: *Krukoff 4089, 4119* and *4141* (BO, L, US), fr. X—XI; Sumatra, without loc.: *Forbes 3093* (FI, L), ♀.

Malay Peninsula. Selangor, Kuala Lumpur, Weld Hills: *Soh 40979* (KEP), fr. XI; Sungei Buloh: *Sidik 44909* (KEP); Malacca, Merlimau: *Alvins s.n.* (SING), ♂ IV; Johore, Mawai-Jemulang Road: *Corner 29029* (BO), buds II; ibid.: *Corner 29031* (BO, KEP), ♂ II; ibid.: *Corner 29440* (BO, KEP), fr. V; Tebrau: *Ridley 13512* (BM), detached fr. VIII; Singapore, Tanglin: *Ridley 6208* (BM), ♀; Bukit Timah: *Yassin 36413* (KEP), ♂ V; ibid.: *Sinclair s.n.* (L), fr. XI; Tanjong Gul: *Sinclair s.n.* (L); Malay Peninsula, without loc.: *Maingay 303* (L), fr., *isotype* of *S. apiculata* Benn.

Borneo. Sarawak, Matang: *Beccari 1602* (FI), ♂ V; Matang Road: *Ridley s.n.* (BM), fr. I; no loc.: *Native coll. 1849* (US), fr.; Brunei: Pak Gabah: *Flemmich 34514* (KEP), ♂ IV; British North Borneo, Upper Kinabalu, Gurulau

Spur: *Clemens 50441* and *50563* (L), ♂ II; Borneo, without loc.: *Teysmann s.n.* (FI), fr.; South and East Borneo, Loa Djanan, W. of Samarinda: *Kostermans 6692* (L), young fr. IV.

CELEBES. Central Celebes, Masamba, Patila: *NIFS bb. 24503* (L).

MOLUCCAS. Morotai: *Main & Aden 1103* (BO, L), fr. V; ibid., G. Sangawo: *Main & Aden 995* (BO, L), fr. V; Ceram, no loc.: *De Vriese s.n.* (L).

Remarks: Trees, 6—20 m, rarely up to 25 m high. Flowers white or yellowish, with yellow anthers. Fruits green, turning yellowish, red and ultimately purplish black. *Habitat*: Forest, collected at altitudes from 10 m to 1500 m, usually on dry grounds, rarely in swampy forests. *Flow. and fruit. times*: In Sum. fl. in VIII—IX (Palemb.), fr. in X—XI (Eastc., Palemb.). In Mal. Penins. fl. in IX—XI (Pah., Selang.) and in II—V (Perak, Selang., Joh., Sing.), fr. in X—I (Selang., Per., Pah., Sing.) and in V—VI (Selang., Joh., Malacca). In Born. fl. in IV—V (Brun., Sar.) and in X—XI (Sar., Br. N. Born.), fr. in X and I (Sar., S. & E. Born.). In Luzon fl. in V, fr. in V and X. In Morotai fr. in V, in Ceram fl. in XI, in Ambon fl. between VII—XI.

12. S. nervosa H. J. Lam, 1932a, 206; Lam 1932b, 387, fig. 29.

Misc. inform.: Hildebrand 1949d, f, g, h, 1952d.

Type specimen: *Grashoff 960* (*lectotype*) in L.

Distribution: Sumatra (Riouw, Djambi, Palembang), Malay Peninsula (Perak), Bangka, Borneo (W. and S. & E. Born.).

Branchlets 0.4—0.8 cm thick, ferruginous-tomentose at tips, medulla without resiniferous ducts. *Leaves* 1½—3½, mostly 2½-jugate; petioles slightly to strongly flattened at base, 4—9(—13.5) cm long, 0.25—0.4 (—0.6) cm wide at base, medulla with one to some resiniferous vascular bundles; interjugae 1.3—3.5(—4.5) cm long; leaflets oblong to ovate or rarely subrotundate, 5.5—17(—22) cm long, 3—7.5(—10.5) cm wide, base broadly acute to rounded, apex acuminate, acumen 0.5—1 cm long, indumentum variable, tomentose when young, afterwards glabrate, petiolules 0.5—1.5(—2) cm long, terminal ones 1.3—2.5(—5) cm long; midrib hardly prominent above, prominent below, at both sides or only at lower side, the secondary nerves only below, with small, i. s. ferruginous, fasciculate to dendriform hairs, sometimes mixed with simple ones; secondary nerves 10—15(—18), not prominent above, prominent below, angle with midrib 80°—90° at base, 65°—80° for the rest, more or less curved, diminishing, in base and apex — rarely also elsewhere — archingly joined near margin; tertiary nerves transverse, conspicuous, especially below. *Inflorescences* axillary or lateral, ferruginous-tomentose, often being short, leafless, axillary or lateral shoots with terminal bud, narrowly paniculate, 1.5—5.5 cm long; bracts deltoid, tomentose without, glabrous within; pedicels tomentose. *Flowers* glabrous, sessile, ca 0.2 cm long. *Calyx* lobes acutely deltoid. *Petals* ovate or orbicular, with hardly inflexed apiculum. *Stamens* inserted outside disc, mono- or slightly didynamous, 0.125—0.15 cm long in ♂ flowers, smaller in ♀ ones; filaments broadened at base; anthers ovate to lanceolate. *Disc* thick-annular or (in ♀ flowers) cupular, radially furrowed and with undulate rim. *Ovary* ellipsoid, stigma subrotundate, subsessile, in ♂ flowers ovarial rudiment little exsert from disc. *Infrutescences* and *fruits* unknown.

SUMATRA. Riouw and Dependencies, Indragiri, Kuala Belilas: *NIFS bb. 27621* (L); ibid., Danau Mengkuang: *NIFS bb. 27494* (L); Kuantan Districts, Tjerenti: *NIFS bb. 25220* (L); Palembang, Banjuasin and Kubu Districts: *Grashoff 960* (L), ♂ II, *lectotype* of *S. nervosa* H. J. Lam.

MALAY PENINSULA. Perak, Trolak: *Ja'amat & Tachun 43404* (KEP, L), ♂ II.

BORNEO. West Borneo, Melawi, Melaban ketjit: *NIFS bb. 28349* (L); South and East Borneo, West Kutei, Mujup: *NIFS bb. 16802* (L).

Remarks: *Habitat*: collected at low altitudes (up to 60 m), in West Borneo once at 345 m. *Vernac. names*: kedudong (Mal. Penins.). *Flow. time*: In Sum. (Palemb.) and Malay Penins. (Perak) fl. in II.

13. S. rubra Ridley, Kew Bull. 1930, 86; Lam 1932b, 378, fig. 24.

Type specimen: *Haviland 2269* in BM, dupl. in L.

Distribution: Malay Peninsula, Borneo (Sarawak).

MALAY PENINSULA. Perak, Trolak: *Ja'amat & Tachun 43423* (KEP), ♀ II; ibid.: *Ja'amat 43500* (KEP); Selangor, Sungei Buloh: *Symington 44727* (KEP); Buloh Subang: *Ja'amai & Tachun 37985* (KEP), young fr. I; Negri Sembilan, Seremban, Sungei Mengala: *Wyatt-Smith 70334* (KEP); Pahang, Kemansul: *Browne 40867* (KEP).

BORNEO. Sarawak, near Kuching: *Haviland 2269* (BM, L), ♂ I, *type* of *S. rubra* Ridl.

Remarks: Medium-sized tree, up to 20 m (type specimen recorded as a "large tree"), buttressed, bark "smooth greenish yellow lenticellate scaly" (*Wyatt-Smith 70334*). Petals red, fruits pink to red. *Vernac. names*: kedondong (Mal. Penins.). *Flow. and fruit. times*: In Mal. Penins. fl. in II, fr. in II—III. In Sarawak fl. in I.

14. S. violacea H. J. Lam, 1932a, 205 and 1932b, 379, fig. 26.

Misc. inform.: Hildebrand 1949c.

Type specimen: *NIFS bb. 13040* in BO, dupl. in L.

Distribution: one specimen collected in Borneo (S. & E. Born.).

Tree, ca 40 m high. Branchlets thick, 1—1.2 cm thick, glabrous, medulla without resiniferous ducts. *Leaves* glabrous, 3½—5½-jugate; petioles 7.5—14.5 cm long, strongly flattened at base, ca 1 cm broad, striate, transversely rugose when dry, medulla with many resiniferous vascular bundles; interjugae 2—4 cm long, lowest ones shortest; leaflets oblong to oblong-lanceolate, 10—16 cm long, 4.3—5 cm wide, base rounded to broadly acute, apex gradually narrowed, not or hardly acuminate, petiolules 1.2—1.5 cm long, terminal ones 2—3.5 cm; midrib not prominent above, very prominent below, as are secondary nerves; secondary nerves 8—11, angle with midrib 70° (in base) —30° (in apex), not joined near margin; tertiary nerves laxely reticulate, hardly conspicuous at both sides. *Inflorescences* and *flowers* unknown. *Infrutescences* axillary, paniculate, glabrous, branched from the base, 2.5—4.5 cm long. Pedicels ca 0.5 cm long, 0.3—0.4 cm in diam. Fruiting calyx and disc under the fruit annular, calyx more or less trigonous; remainders of stamens inserted on rim of disc. *Fruits* (descr. f. Lam) subglobose, 1.5—1.6 cm diam., style strongly excentric, near pedicel; putamen 0.07 cm thick, cotyledons pinnate?, plicate in the seed.

BORNEO. South and East Borneo, Tanah Bumbu, Kamp. Baru: *NIFS bb. 13040* (L), infrut. without fr. XII, *isotype* of *S. violacea* H. J. L.

Remarks: In many respects resembling *S. laevigata*, but differing by having fewer secondary nerves, much smaller and stouter infrutescences and thicker fruit pedicels.

Sectio ICICOPSIS

15. S. nana H. J. Lam, 1932a, 207 and 1932b, 403, fig. 39. — *Fig. 11.*
Type specimen: *Beguin 585* in L.
Distribution: Sumatra (Eastcoast), Malay Peninsula (Selangor).
Tree. Branchlets thin, terete, 0.2—0.4 cm thick, tips densely erect-pilose as are petioles, rhachis, petiolules and inflorescences, medulla without resiniferous ducts. *Leaves* 1½—4½-jugate; petioles terete, 1.5—4 cm long, medulla with some to rather many resiniferous ducts; interjugae 1—3.3 cm long; leaflets ovate-lanceolate to (especially the apical ones) obovate, 2—7.5 cm long, 1—3.5 cm wide, base broadly acute to more or less rounded, often oblique, apex shortly and bluntly acuminate, petiolules 0.15—0.6 cm long, terminal ones 0.5—1.5 cm long; both sides of leaflets pilose, especially on lower side and on nerves; midrib prominent at either side, especially below;

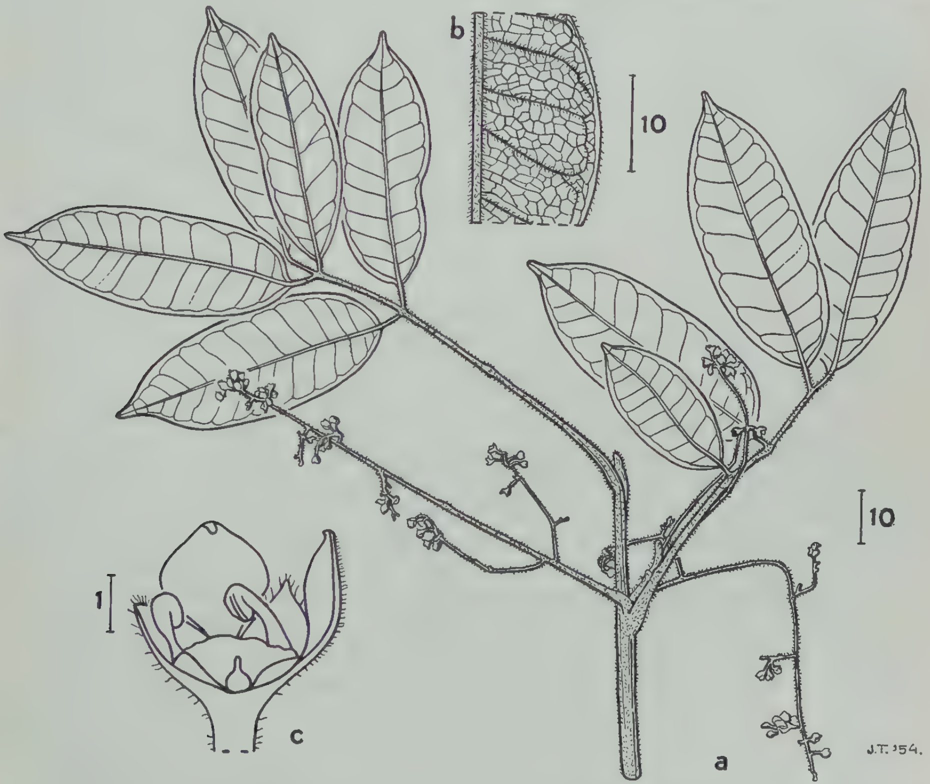

Fig. 11 — *Santiria nana* H. J. Lam — a. branchlet showing leaves and ♂ inflorescence; b. part of leaflet showing venation and indumentum; c. ♂ flower, longitudinal section. — dimensions in mm — from *Sow-Lindong 76027.*

secondary nerves 8—12, conspicuous at either side, angle with midrib 65°—80°, more or less distinctly archingly joined near margin; tertiary nerves reticulate, a stronger one between and parallel with every two secondary nerves. ♂ *Inflorescences* (♀ unknown) axillary, 4—9 cm long, branched from base, all branches up to pedicels densely pilose; pedicels 0.05—0.15 cm long. ♂ *Flowers* ca 0.15 cm long in bud. *Sepals* deltoid, ca 0.1 cm long and wide, pilose without, glabrous within. *Petals* rhomboid, ca 0.2 cm long and wide, pilose without, inner side with some hairs, apiculum slightly inflexed. *Stamens* 3, episepalous, inserted under rim of disc, ca 0.15 cm long, anthers adnate, broadly ovate. *Disc* cupular, with undulated rim. Receptacle slightly developed. *Ovarial rudiment* not exsert from disc. *Infrutescences* very short, 1—1.5 cm long, pilose. *Fruit* (only one seen) irregularly globose, 0.9 cm long, 0.7 cm in diam., style rudiment little excentric; pericarp and putamen very thin; cotyledons pinnate?, plicate in the seed; fruiting calyx 0.4 cm in diam., lobes deltoid, acute, often reflexed, 0.2 cm long, subglabrous; fruit pedicel 0.4 cm long.

SUMATRA. Eastcoast, Bengkalis, Panglang, Sungei Missigit: *Beguin 585* (L), one detached fr. I, *type.*
MALAY PENINSULA. Selangor, Klang, Talan Binting: *Sow-Lindong 76027* (KEP), ♂ XI.

Remarks: This species is closely allied to *S. rubiginosa*, but differs in the dense indumentum on all parts. Perhaps it may prove to be only a variety of that species.

Tree, 15—30 m high. Flowers according to Lam, l. c., green with some red, according to Sow-Lindong yellow.

16. S. rubiginosa Blume, Mus. Bot. Lugd.-Bat. 1, 14, 1850, 213; Lam 1932b, 399, fig. 37; Cretzoiu 1934, 265; Lam 1938, 140. — *S. lamprocarpa* Lauterbach, Engl. Bot. Jahrb. 56, 1920, 337; Lam 1932b, 402, fig. 38; Lam 1938, 140, 142, 157. — *S. pedicellata* Ridley, Kew Bull. 1930, 86; Lam 1932b, 398, fig. 36. — *S. minimiflora* Ridley, Kew Bull. 1930, 87 (e descr.); Lam 1932b, 398, fig. 35; Lam 1938, 140.

Misc. inform.: Hildebrand 1949a, b, d, e, f, g, h, i, 1950a, b, 1952a, c, d, e.

Type specimen: *Praetorius s.n.* (L, nr 898.321—229).

Distribution: Sumatra, Malay Peninsula, Bangka, Billiton, Borneo, New Guinea (Biak, Sepik).

Branchlets slender, up to 0.5 cm thick, glabrous except tips and terminal buds, medulla without resiniferous ducts, sclerenchymatic. *Leaves* 1½—5½(—6½)-jugate; petioles not or hardly flattened at base, 1.5—7.5 cm long, glabrous or more or less densely and minutely tomentose, medulla with one or some few resiniferous vascular bundles; interjugae 1.2—5.2 cm long; leaflets elliptic or ovate to lanceolate or lanceolate-oblong, not always strictly opposite, terminal leaflet often wanting, 3—11(—14.5) cm long, 1—5.5 (—7) cm wide, base more or less broadly acute, sometimes more or less abruptly narrowed, apex usually acuminate, sometimes bluntly acute, acumen up to 1.5 cm long, petiolules 0.3—1(—1.5) cm long, terminal ones 0.8—3.2(—4) cm, leaflets glabrous except sometimes on midrib below; midrib and secondary nerves hardly prominent below; secondary nerves 9—15 and some more in apex, angle 60°—80°, furcate near margin and more or less distinctly archingly joined, very slender; tertiary nerves laxely reticulate, very slender, often a stronger one between every two secondary ones, reaching halfway the margin. *Inflorescences* axillary or lateral, glabrous or minutely pulverulent, branched from base or (especially ♀ ones) with short peduncle, paniculate, (1—)4—16.5 cm long, lowest ramifications up to 10 cm long; bracts minute, narrowly deltoid, deciduous or subpersistent; pedicels very slender, 0.05—0.6 cm long. *Flowers* 0.15—0.2 cm long in bud. *Calyx* with 3 nearly free, ovate to deltoid, subacute segments, glabrous or slightly pubescent, especially at margins, in ♂ flowers 0.1—0.15 cm, in ♀ flowers up to 0.25 cm long. *Petals* ovate to rhomboid, narrowed at base, slightly inflexed at apex, 0.2—0.25 cm long, 0.15—0.2 cm wide, glabrous or slightly pubescent. *Stamens* 3, episepalous, sometimes with rudiments of 3 epipetalous ones, filaments inserted on or very near rim of disc, anthers adnate, ovoid to deltoid. *Disc* cupular, with truncate rim, in ♀ flowers a more or less distinctly developed receptacle. *Ovary* ovoid, with short style and 3-lobed stigma in ♀ flowers, in ♂ flowers much reduced, not exsert from disc. *Fruits* irregularly globular or ellipsoid, oblique, stigmatic scar somewhat excentric, 0.8—1.3 cm long, 0.7—0.9 cm in diam.; calyx spreading, 0.35—0.45 cm in diam.; pericarp and putamen thin, cotyledons pinnate, folded in the seed.

Remarks: The four species *S. rubiginosa* Blume, *S. lamprocarpa* Lauterbach, *S. pedicellata* Ridley and *S. minimiflora* Ridley are combined here and the resulting species *S. rubiginosa* is subdivided into two varieties, *rubiginosa* and *pedicellata.*

The only difference between *S. rubiginosa* and *S. lamprocarpa* seems to be that the former shows sometimes and the latter always (but only 2 flowering specimens are known) rudiments of the three epipetalous stamens. This is why — in spite of the distributional difference (*S. lamprocarpa* was only known from New Guinea) — the specific distinction is dropped here.

The differences between *S. pedicellata* and *S. rubiginosa* are very slight, the main point being the length of the pedicel. The other features, mentioned by Lam 1932b, 399, are not decisive (apex of sepals subrounded in *pedicellata,* subacute in *rubiginosa,* in ♀ flowers the filaments shorter than or as long as anthers in *pedicellata,* usually longer than anthers in *rubiginosa*).

Of *S. minimiflora* I did not examine the type specimen *Haviland 1783* (*1703* according to Ridley, l. c.), but the description shows that the only difference with *S. rubiginosa* lies in the somewhat smaller dimensions of the leaves. The length of the pedicels gives it a place in var. *pedicellata.*

Sterile specimens are sometimes hardly to be distinguished from *S. griffithii* and the identification of such specimens is therefore not always sure. *S. rubiginosa* has usually fewer pairs of leaflets, which are, however, larger.

The type variety and var. *pedicellata* are only distinguishable when fertile material is at hand. The sterile material is here mentioned under the type variety (except *Becking 77,* which possibly belongs to var. *pedicellata*).

Var. **rubiginosa** — *S. rubiginosa* Blume — *S. lamprocarpa* Lauterbach. — Pedicels 0.1—0.3 cm long, shorter than or as long as the flowers.

Distribution: as the species.

Sumatra. Eastcoast, Lower Langkat, Alur Gusta: *NIFS bb. 16416, bb. 16420, bb. 16421* and *bb. 16597* (L); Tapanuli, Barus, Kobun, M. Tapus: *NIFS bb. 31020* (L); Westcoast, Bangkinang, Sungei Durian: *NIFS bb. 23387* (L); Riouw and Dependencies, Kuantan Districts, Pulau Kedondong: *NIFS bb. 24802* and *bb. 24829* (L); ibid., Djake: *NIFS bb. 26479* (L); Indragiri, Muara Padjangki: *NIFS bb. 27492* (L); ibid., Kwala Belilas: *NIFS bb. 27595* and *bb. 27634* (L); ibid., Pagarumbei, Tjenako river: *NIFS bb. 25796* and *bb. 26105* (L); ibid., Danau Mengkuang: *NIFS bb. 27496* (BO); ibid., Kw. Keritang: *NIFS bb. 28704* (BO); Palembang, Lematang Ilir, Semangus: *NIFS bb. 31701* (L); Sumatra, without loc.: *Forbes 2773* (BM, CAL), ♂; ibid.: *Praetorius s.n.* (L, nr 898.321—229), *type* of *S. rubiginosa* Bl.

Malay Peninsula. Perak, Larut: *King's coll. 5573* (A, CAL, E, FI, MEL, W), young fr. II; ibid.: *King's coll. 5545* (CAL, DD, G), young fr. II; Batang Padang Districts: *Kunstler 7997* (CAL, DD, P, Z), young fr. VIII; Gopeng: *King's coll. 5937* (CAL, FI, G, L), fr. IV; Trolak: *Speldewinde 5379* (KEP); Bubu: *Symington 29881* (KEP); ibid.: *Wray 3865* (CAL), ♂ III; no loc.: *Scortechini s.n.* (CAL), ♂; Selangor, Rantau Panjang: *Zain 24900* (KEP); Gombak: *Hamid & Ja'amat 10916* (KEP), fr. XI; Bukit Cherake: *Wyatt-Smith 70355* (KEP), young fr. III; Kuang: *Symington 22133* (KEP), young fr. I; Ulu Langat, Sungei Puteh: *unknown coll. 50422* (KEP); Kuala Lumpur, Public Gardens: *Meh 10323* (KEP), fr. VI; ibid., Ayer Hitam: *Omar & Ja'amat 10901* (KEP), young fr. XI; ibid., Weld Hills: *Abd. Rahman 2811* (KEP), ♂ III; no loc.: *Boswell 49914* (KEP); Pahang, Rotan Tunggal: *Kalong 23401* and *Osman 28510* (KEP); Kuantan, Pekan Road: *Ja'amat & Sow 43187* (KEP); Tras: *Strugnell 20235* (KEP), fr. IV; Johore, Kluang, Rengam: *Cousens 69788* (KEP); Malay Reservation, Pekan Nenas: *Yasin bin Abu 70908* (KEP); West Muar, Lenga, Ma'okil: *Sulaiman bin Manja 70207* (KEP); Pontian: *Ywans bin Ismail 70861* (KEP); Singapore, Bukit Timah: *Corner 34953* (L), young fr. III; Changie: *Ridley 1858* (BM), fr. XII.

Bangka. South Bangka, Rindik-Toboali: *NIFS bb. 29216* (L).

Billiton. no loc.: *Herb. Biliton (coll. unknown) 78* (L).

Borneo. West Borneo, Melawi, B. Ulu Bora ketit: *NIFS bb. 29048* (L); ibid., B. Kelawaideras: *NIFS bb. 28120* (BO); South and East Borneo, Upper Mahakam, D. Parei: *NIFS bb. 20689* (BO, L); Sampit: *NIFS bb. 32385* = *Buwalda 8* (BO, L); West Kutei, Mujup: *NIFS bb. 16837, bb. 16844* and *bb. 16867* (L).

New Guinea. Biak: *NIFS bb. 30775* and *bb. 30866* (L); North East New Guinea, Sepik region: *Ledermann 9668* (L), ♀, *type* of *S. lamprocarpa* Laut.; ibid.: *Ledermann 9695* (L), young fr.; ibid.: *Ledermann 9812* (L), ♂.

Remarks: Trees, rarely higher than 30 m, sometimes buttressed, bark greyish, smooth and flaking. Once reported as a "creeper" (*Ridley 1858*). Resin white. Flowers green, disc yellow, bracts nearly white. Fruits green when young, turning red, finally blue. *Habitat*: From sea level up to 500—600 m, one record (Pahang) from 1200—1300 m. *Vernac. names*: resung, paha rusa (Sum., Eastc.), maradjalai (Sum., Riouw), kedondong, k. matahari (Malay Penins.), k. bukit, seruyan batu (Joh.), kilat (Selang.), babi kurus (Perak), palai (W. Born.), salak gading (Saraw.), kauwtjulie, batu (S. & E. Born.). *Flow. and fruit. times*: In Sum. fl. in III & IX (Pal.), fr. in IV—V, VIII (Pal.), X—XI (Pal., Riouw). In Mal. Penins. fl. in I (Mal.), III (Sel.), VII (Perak), fr. in XI—VI. In Born. (Sar.) fl. in VIII—X, fr. in III.

Var. **pedicellata** (Ridley) nov. comb. — *S. pedicellata* Ridley — *S. minimiflora* Ridley (e descr.). — Pedicels 0.2—0.6 cm long, longer than flowers.

Type specimen: *Haviland 1866*.

Distribution: Borneo (Sarawak, W. Borneo).

Borneo. West Borneo, Paloh: *Becking 77* (L); Sarawak, Sixth Mile:

Egon 559 (KEP), fr. XI; Rejang, Sibu: *Haviland 1866* (SING), ♀ X, *type* of *S. pedicellata* Ridl.; no loc.: *Beccari 3319* (FI), fr., see Remarks.

Remarks: The Florence sheet of *Beccari 3319* bears the correct number on the slip of paper, which is fixed to the plant, but on the sheet the wrong number *3165* has been written.

17. S. griffithii (Hooker f.) Engler in DC, Mon. Phan. 4, 1883, 155; Lam 1932b, 394, fig. 34; Lam 1938, 140.

Misc. inform.: Heyne 1950, 881; Hildebrand 1949a, b, e, f, g, h, 1950 b, 1952a, b, c, d, e; Sinia 1938, 80, 85, 92; Webber 1941, 441—465.

Type specimen and basonym: *Griffith 1148* (K, dupl. in L), *type* of *Trigonochlamys griffithii* Hooker f., Trans. Linn. Soc. 23, 1, 1860, 170.

Distribution: Sumatra, Malay Peninsula, Bangka, Borneo.

SUMATRA. Tapanuli, Sibolga c. a., Barus: *NIFS bb. 28441* (L); Riouw and Dependencies, Indragiri, Muara Padjanki: *Buwalda 6409* (BO, L), fr. IV; ibid., Muara Serangge: *NIFS bb. 30051* (L); Kuantan Districts, Sungei Rambei: *NIFS bb. 23477* (L); ibid., Muara Pantei: *NIFS bb. 23852* (L); ibid., Djake: *NIFS bb. 26464* (L); Palembang, Lematang Ilir, Semangus: *NIFS bb. 32221* (L) and *bb. 32236* (BO); Musi Ulu, Semangus: *NIFS bb. 23568* (BO); no loc.: *Boswezen T. O. 2* (L), fr. III.

MALAY PENINSULA. Perak, Larut: *King's coll. 10221* (L), fr. I; ibid., Gopeng: *King's coll. 4625* (L), fr. VII; Trolak: *Browne 43495* (KEP); Selangor, Rantau Panjang: *Zain 24899* (KEP); Kuala Belata: *Hamid 32393* (KEP); Sungei Bulang Subang: *Ja'amat & Tachun 37991* (KEP); Sungei Buloh: *Ja'amat 15324, Symington 38126, Symington 44705* and *Sidik 44908* (KEP); Pahang, Petoh, Sungei Rompin: *Dolman 6772* (KEP), ♀ IV; Raka Hill: *Zin 27509* (KEP); Mentas: *Bidun 15689* (KEP), fr. V; Malacca, Bukit Sedanan: *Mat Pol 18259* (KEP); Batang Malaka: *Ridley s.n.* (BM); Bukit Senggeh: *unknown coll. 9297* (KEP); Johore, Mersing: *Latiff bin Dimal 70091* (KEP); Singapore, Bukit Timah: *Corner 34872* (KEP, L), ⚦ IV; Malay Peninsula, without loc.: *Griffith 1148* (L), young fr., *isotype* of *Tr. griffithii* Hook.f.

BANGKA. North Bangka, Sungei Buluh: *NIFS bb. 20574* (BO, L), buds XII; Perlang: *NIFS bb. 34082 = Kostermans 148* (BO, L); ibid.: *NIFS bb. 34114 = Kostermans 180* (BO, L), fr. IX; South Bangka, Rindik Toboali: *NIFS bb. 29214* (L); ibid.: *NIFS bb. 29215* (L), buds IX; Lobok Besar: *Anta 556* and *NIFS bb. 34031 = Kostermans 94* (BO, L), ⚦ IX; ibid.: *Anta 214* and *NIFS bb. 33973 = Kostermans 35* (BO, L), ♀ VIII; ibid.: *Anta 570* (BO, L), ♀ IX; ibid.: *Anta 1105* (BO, L), fr. X; ibid.: *Anta 846* and *NIFS bb. 33999 = Kostermans 61* (BO, L); ibid., G. Pading: *Anta 979* (BO, L), fr. IX; G. Mangkol: *Anta 758* (BO, L).

BORNEO. Sarawak, Sipang, Sabu: *? Abdulmajio 64105* (KEP); Kuching: *Beccari 417* (FI), ⚦ VIII; ? Semengoh: *unknown coll. 377* (KEP), gall fl. X; no loc.: *Beccari 2692* (FI), ⚦, *isotype* of *S. bornensis* Engler; British North Borneo, Tawau, Umas-Umas: *Maidin 36910 = S. H. 4132* (BO, KEP), young fr. XI; South and East Borneo, Tidung c. a.: *NIFS bb. 18347* (BO); ibid., Tanah merah: *NIFS bb. 18134* (BO), fr. XII; ibid.: *NIFS bb. 18243* (BO); West Kutei, Mujup: *NIFS bb. 16794, bb. 16863, bb. 16869* and *bb. 16896* (L); Bulungan, Nunukan: *NIFS bb. 26210* (L); Loa Djanan, West of Samarinda: *Kostermans 6405* (L), fr. IV; ibid.: *Kostermans 6581* (L), ⚦ IV; Tdg Bangko, near Mahakam River estuary: *Kostermans 7106* (L), young fr. V; Balikpapan, Sungei Wain: *Kostermans 4045* (L), ⚦ X, *4055* (L), fr. X and *4300* (L); ibid., Mentawir: *Kostermans 4417* (L), ⚦ X.

Remarks: Lam, 1932a, 206 and 1932b, 395, distinguishes three forms: *genuina* (small leaflets, large flowers and fruits), *bornensis* (small leaflets, smaller flowers and fruits) and *macrophylla* (larger leaflets). It is true that there is much variability in the flower dimensions, but the transitions are so gradual, that any subdivision must remain arbitrary and unnatural. The variability is at least partly due to the growth of the calyx as the fruit ripens and is, consequently, much less pronounced in ♂ than in ♀ flowers.

I only saw one specimen of the two, cited by Lam as forma *macrophylla* (*Othaman 529* with the leaflets 9—13 cm long) and I am inclined not to make a separate form of it.

For the distinction of this species from *S. rubiginosa,* see there.

Moderate-sized trees, 12—35 m high, buttressed, with scaling, greyish or yellowish bark that exudes a sticky, yellowish or black resin (perhaps light coloured when fresh, blackening when older). Flowers recorded as being brownish, orange or greenish (calyx green and brown pubescent, according to Lam), with white petals. Fruits green, turning red and finally blue or purple. *Habitat*: Forest, from sea level up to 300 m. Once collected in swampy country (Bangka). *Vernac. names*: bebeka, kedungdung (Sum., Palemb.), kasai bukit, kedundong (Mal. Penins.), rengas, r. merah, mesanit, menjantung (Bangka), pamutalun (Br. N. Born.), tampiras, ampiras, buno, bumbun gunung, kumbajau burung (S. & E. Born.). *Flow. and fruit. times*: In Sum. fl. in VI—VIII, fr. in II—IV (Pal., Riouw) and VII—IX (Pal.). In Malay Penins. fl. in II—IV, fr. in I and VII (Per.). In Bangka fl. in VIII—IX, fr. in IX—X. In Born. fl. in VI (S. & E. Born.), VIII (Sar.), XI (S. & E. Born.), fr. in XI—XII (Br. N. Born., S. & E. Born.) and in IV—V (S. & E. Born.).

Excluded species.

Santiria boemiensis Kanehira & Hatusima, nomen nudum based on *Kanehira & Hatusima 12790* from Bumi, Nabire, New Guinea
= **Meliaceae** spec.

Santiria yunnanensis Hu, Bull. Fan Mem. Inst., Bot. ser. 10, 3, 1940, 129
= **Protium yunnanense** (Hu) Kalkman, nov. comb.

Examination of the type specimen of *S. yunnanensis* (*Wang 78977*) learned that this does not belong to Santiria, but certainly to the genus Protium. It is related to *P. serratum* (Wall. ex Colebr.) Engl., differing by having glabrous leaves and larger fruits.

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1949e: Sumatra, Eastcoast — ibid. nr 9;
1949f: Sumatra, Bengkalis & Indragiri — ibid. nr 11;
1949g: Bangka & Billiton — ibid. nr 12;
1949h: Sumatra, Palembang — ibid. nr 19;
1949i: Sumatra, Benkulen — ibid. nr 22;

1950a: Sumatra, Westcoast — ibid. nr 26;
1950b: Sumatra, Tapanuli — ibid. nr 29;
1950c: Sumatra, Atjeh-Simalur — ibid. nr 32;
1950e: Java, Madura — ibid. nr 35;
1951a: Celebes, Manado — ibid. nr 44;
1951d: Java, Madura (revised) — ibid. nr 50;
1952a: W. Borneo (revised) — ibid. nr 54;
1952b: E. Borneo, Bulungan & Berau (revised) — ibid. nr 55;
1952c: Sumatra, Eastcoast (revised) — ibid. nr 56;
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The number in parentheses indicates the number of the species in the present paper. VII = Triomma, VIII = Dacryodes, IX = Santiria.

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— *crassipes Kalkm. (VIII, 12)
— elmeri H. J. Lam (VIII, 16)
— expansa (Ridl.) H. J. Lam (VIII, 6)
— floribunda (King) H. J. Lam (VIII, 15)
— incurvata (Engl.) H. J. Lam (VIII, 3)
— *kostermansii Kalkm. (VIII, 11)
— laxa (Benn.) H. J. Lam (VIII, 1)
— — var. *forbesii* (Bak.f.) H. J. Lam (VIII, 1)
— — var. *typica* H. J. Lam (VIII, 1)
— longifolia (King) H. J. Lam (VIII, 5)

Dacryodes longifolia (King) H. J. Lam var. longifolia (VIII, 5)
— — var. penangensis (Ridl.) H. J. Lam (VIII, 5)
— — var. *typica* H. J. Lam (VIII, 5)
— macrocarpa (King) H. J. Lam (VIII, 10)
— — var. *genuina* H. J. Lam (VIII, 10)
— — var. macrocarpa (VIII, 10)
— — var. merrillii H. J. Lam (VIII, 10)
— papuana Husson (VIII, 9)
— puberula (Benn.) H. J. Lam (VIII, 8)
— rostrata (Bl.) H. J. Lam (VIII, 14)
— — forma cuspidata (Bl.) H. J. Lam (VIII, 14)
— — forma *genuina* H. J. Lam (VIII, 14)
— — forma pallida H. J. Lam (VIII, 14)
— — forma pubescens H. J. Lam (VIII, 14)
— — forma rostrata (VIII, 14)
— — forma *samarensis* H. J. Lam (VIII, 14)
— rubiginosa H. J. Lam (VIII, 17)
— rugosa (Bl.) H. J. Lam (VIII, 2)
— — var. *genuina* H. J. Lam (VIII, 2)
— — var. *moultonii* (Ridl.) H. J. Lam (VIII, 2)
— — var. rugosa (VIII, 2)
— — var. virgata (Bl.) H. J. Lam (VIII, 2)
— scandens Husson (VIII, 13)
— ? spec. (VIII, 18)
Dracontomelon cuspidatum Bl. (VIII, 14)
Eusantiria Engl. (sectio) (IX)
Hemisantiria nitida (Merr.) H. J. Lam (VIII, 3)
Icicopsis Benn. (sectio) (IX)
Pachylobus (Don) H. J. Lam (sectio) (VIII)
*Protium yunnanense (Hu) Kalkman (IX, excl. spp.)
Santiria Bl. (IX)
— apiculata Benn. (IX, 11)
— *boemiensis* Kan. & Mat. n.n. (IX, excl. spp.)
— conferta Benn. (IX, 2)
— — var. *typica* H. J. Lam (IX, 2)
— — var. *wrayi* (King) H. J. Lam (IX, 2)
— *costata* Benn. (VIII, 4)
— *floribunda* King (VIII, 15)
— *forbesii* Bak.f. (VIII, 1)
— *grandiflora Kalkm. (IX, 1)
— griffithii (Hk.f.) Engl. (IX, 17)
— — forma *bornensis* (Engl.) H. J. Lam (IX, 17)
— — forma *genuina* H. J. Lam (IX, 17)
— — forma *macrophylla* H. J. Lam (IX, 17)
— laevigata Bl. (IX, 8)
— — var. *applanata* Bl. (IX, 8)
— — forma glabrifolia (Engl.) H. J. Lam (IX, 8)
— — forma laevigata (IX, 8)
— — forma *rufescens* (Bl.) H. J. Lam (IX, 8)
— — forma *typica* H. J. Lam (IX, 8)
— *lamprocarpa* Laut. (IX, 16)
— *longifolia* King (VIII, 5)
— *macrocarpa* King (VIII, 10)
— *megaphylla Kalkm. (IX, 7)
— *minimiflora* Ridl. (IX, 16)
— mollis Engl. (IX, 4)
— mollissima Ridl. (IX, 6)
— nana H. J. Lam (IX, 15)
— nervosa H. J. Lam (IX, 12)
— oblongifolia Bl. (IX, 9)
— *pedicellata* Ridl. (IX, 16)

Santiria pilosa Engl. (IX, 5)
— *puberula* Benn. (VIII, 8)
— ridleyi H. J. Lam (IX, 10)
— *rostrata* Bl. (VIII, 14)
— rubiginosa Bl. (IX, 16)
— — var. *pedicellata (Ridl.) Kalkm. (IX, 16)
— — var. rubiginosa (IX, 16)
— rubra Ridl. (IX, 13)
— *rufescens* Bl. (IX, 8)
— tomentosa Bl. (IX, 3)
— violacea H. J. Lam (IX, 14)
— *yunnanensis* Hu (IX, excl. spp.)
Santiriopsis (Engl.) H. J. Lam (sectio) (IX)
Tenuipyrena Engl. (sectio) (VIII)
Trigonochlamys Hk.f. (genus and section) (IX)
— *griffithii* Hk.f. (IX, 17)
Triomma Hk.f. (VII)
— *macrocarpa* Backer (VII)
— malaccensis Hk.f. (VII)

A NEW PREMNA (VERBENACEAE) FROM NEW GUINEA

by

H. J. LAM
(Rijksherbarium, Leiden)

(Issued 18. XII. 1954).

Premna brongersmai, nov. spec. — Frutex? Ramuli teretes conspicue subdistanter lenticellati 0.3—0.5 cm crassi, internodia in specimine 7—11 cm longa. *Folia* coriacea subrigida, decussatim opposita glaberrima petiolata, ovata vel oblongo-ovata vel subovata vel oblongo-lanceolata, basi plus minusve late rotundata, marginibus integra, apice abrupte vel subabrupte peracute acuminata, latiora 8.5—11 × 4.7—5.7 cm, angustiora (in eodem specimine, ut apparet) 12—14.5 × 4—4.5 cm; nervi haud prominentes, costa media subtus prominente excepta; nervi secundarii graciles utrimque 5—7, curvati, margines versus diminuti haud confluentes, tertiarii pertenues subdistanter transversi, reticulatione minutissima areolata; petioli e basi incrassata 1—1.7 cm longi tenues. *Inflorescentiae* paniculatae terminales, partiales inferiores ex axillis foliorum parvorum, superiores ex axillis bractearum subulatarum 0.3—0.1 cm longarum ortae, totae 12—17 cm longae, 17—29 cm latae, partiales medianae longiores, e pedunculo gracili 10—14 cm longae, pseudodichotomice late divaricatae, ramificationes ultimae dichasiales minute pubescentes. *Flores* parvi tetrameri subsessiles, alabastris pyriformibus, glabris; *calyx* glaber cupularis subbilabiatus, c. 0.25 cm altus, labio inferiore acute integro vel leviter acuto-bidentato, superiore 2 lobis majoribus acutis suffulto, calyx intus praecipue dimidio superiore multis glandulis in sicco opacis munitus; *corolla* in regione staminum insertionis tantum intus pilosa, cetera glabra, 0.4—0.45 cm alta, tubo subcylindrico 0.3—0.35 cm longo, limbo aestivatione cochleata subbilabiato, labio inferiore trilobo (lobo medio in alabastro ceteros tegente, 0.15 cm longo, rotundato, lateralibus 0.1 cm longis, subtruncatis), superiore integro 0.1 cm longo subtruncato, in alabastro omnino tecto; regio pilosa sub labio superiore paulo infirmior; *stamina* alternipetala in regione pilosa aequa altitudine inserta, subdidynamia, filamentis sub labio superiore paulo brevioribus in alabastro sigmoideo-sinuatis 0.2 cm longis, sub labio inferiore 0.25 cm longis, omnibus vittatis apice abrupte contractis filiformibus; antherae 0.05 × 0.1 cm, subreniformes, thecae poris ovatis dehiscentes; *ovarium* globosum glabrum 0.15 cm altum 4-loculatum, loculis uniovulatis; ovula longa apotropa medio affixa; stylus filiformis 0.25 cm longus, stigma bilobum, lobis acutis plano mediano patentibus. *Fructus* ignoti.

Shrub? Branchlets (all?) apparently long and drooping, 0.3—0.5 cm

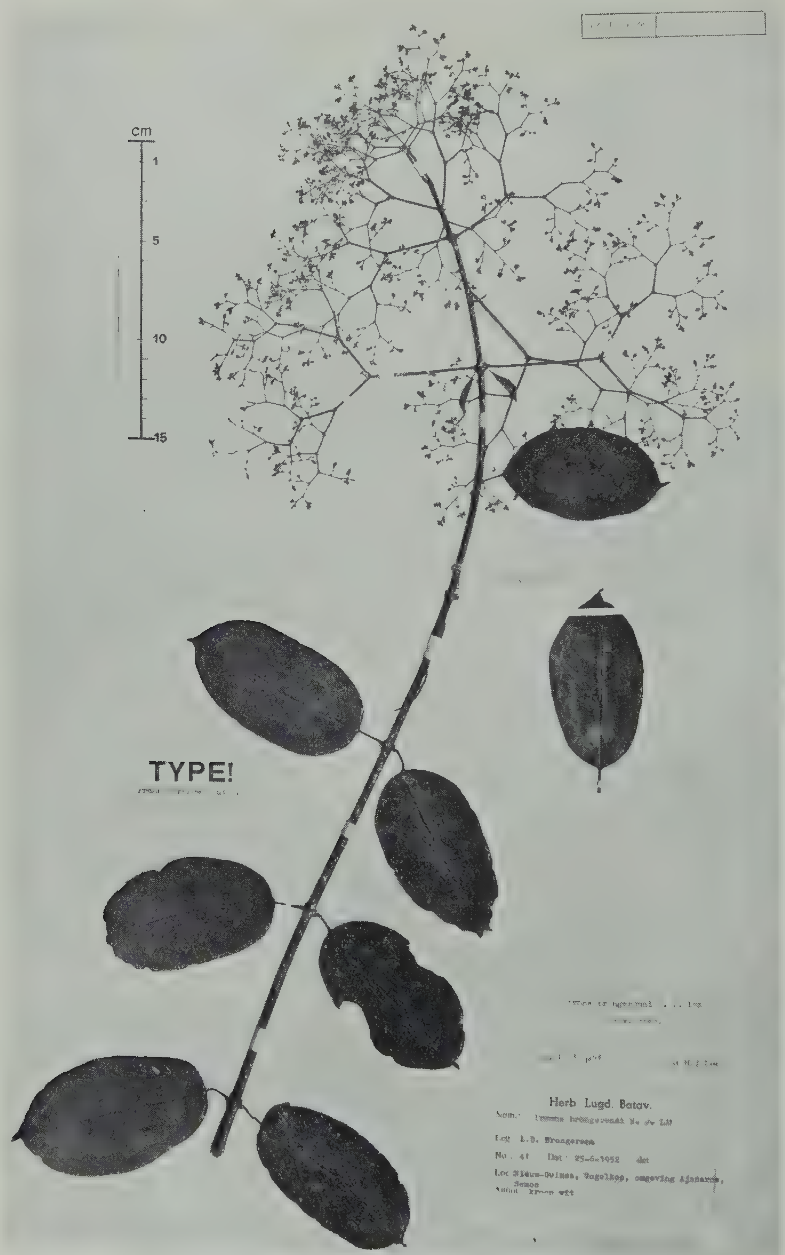

Fig. 1. *Premna brongersmai* H. J. Lam, type specimen.

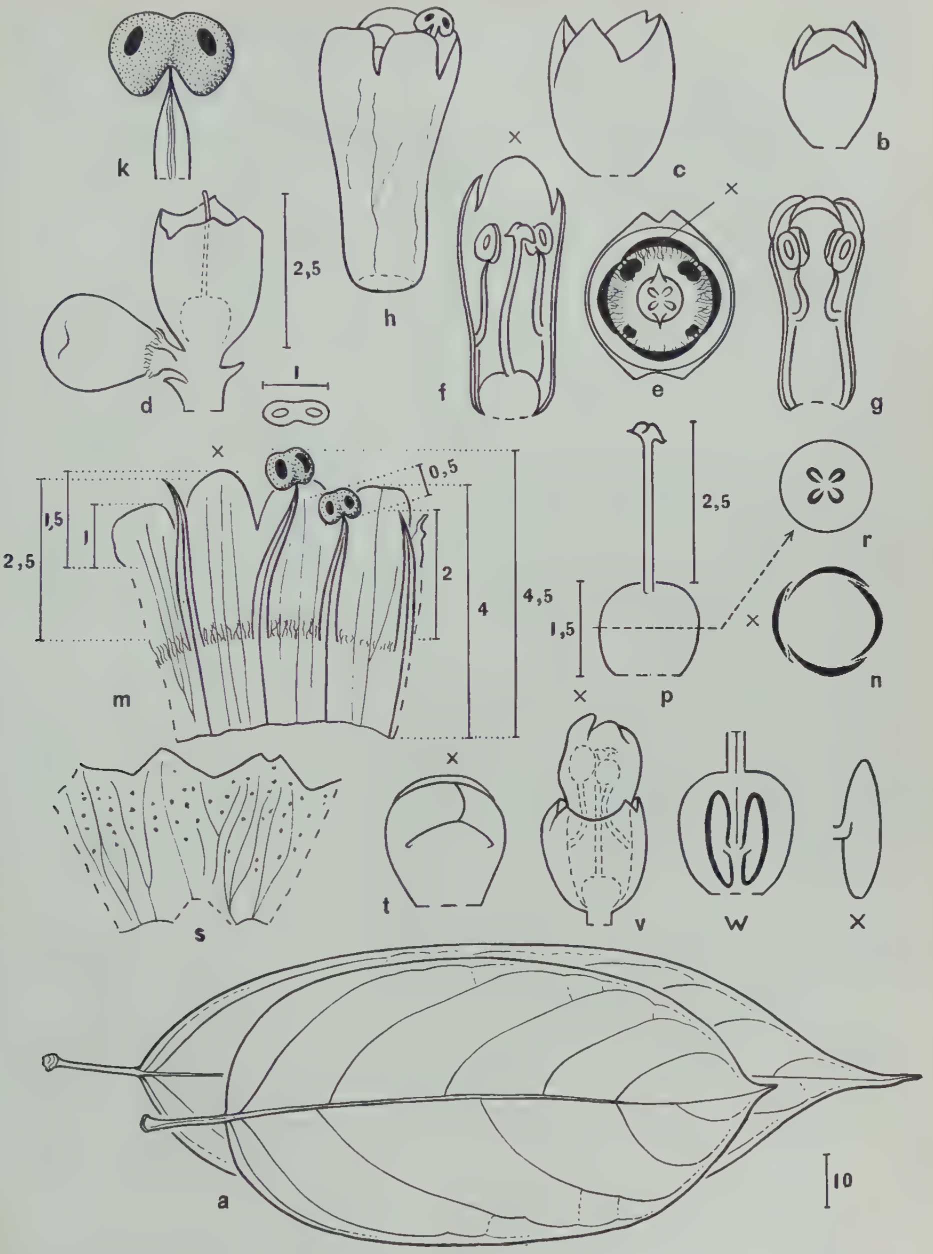

Fig. 2. *Premna brongersmai* H. J. Lam — a. the two leaf types; b. flowerbud with 3-dentate calyx; c. bilabiate 4-dentate calyx; d. terminal monochasium; e. diagram of flower; f. g. two halves of corolla h; k. anther with apex of filament; m. corolla, laid open; n. aestivation of corolla; p. pistillum; r. ovary, cross-section; s. calyx, laid open, showing venation and glands; t. corolla in bud, showing aestivation; v. young flower in optical longitudinal section; w. ovary, longitudinal section; x. ovule. — × indicates midlobe of lower corolla lip; dimensions given are millimeters — from type specimen.

in diam.. *Leaves* decussate, entirely glabrous, ovate to ovate-oblong, base more or less broadly rounded, apex more or less abruptly and very acutely acuminate, margins entire, 8.5—14.5 × 4—5.7 cm, nerves not prominent except midrib below, secondary ones 5—7, curved, reticulation minutely areolate between the almost inconspicuous transverse tertiary ones; petioles 1—1.7 cm long, incrassate at base. *Inflorescences* widely paniculate, terminal, 12—17 cm long, 17—29 cm broad, the lower partial panicles in the axils of ever smaller leaves, the upper ones in those of subulate bracts; ultimate ramifications dichasial, minutely pubescent. *Flowers* subsessile, 4-merous, glabrous but for a hair ring inside at the insertion of the filaments. *Calyx* cupular, more or less bilabiate, 0.25 cm high, lower lip entire or shallowly acutely bidentate, upper one with two larger acute teeth, inside with dispersed dark glands: *corolla* tube subcylindrical 0.3—0.35 cm long, aestivation cochleate, slightly 2-lipped, lower lip 3-lobed, midlobe rounded and 0.15 cm long, lateral ones subtruncate and 0.1 cm long; upper lip entire, 0.1 cm long, subtruncate. *Stamens* 4, subdidynamous, those below upper lip with slightly shorter filaments; filaments ribbon-shaped, 0.2 and 0.25 cm long respectively, subabruptly narrowed below the anther and ending into a very thin apex; anthers kidney-shaped, 0.05 × 0.1 cm, with two ovate pores; *ovary* globose, glabrous, 0.15 cm high, 4-celled, cells uniovulate, ovules long, apotropous, attached in the middle of the cell; style filiform, 0.25 cm long, stigma with two acute lobes spreading medianly. *Fruits* unknown.

New Guinea. "Vogelkop", nr. Ajamaru, Semu, in open country, about 300 m in alt.: *L. D. Brongersma 41* (*type*, L).

Undoubtedly a new species, characterised by its unusually large, possibly drooping panicles. The branches seem to be long and more or less drooping. Its relation is clearly with the wide-spread *P. corymbosa* (Burma f.) Rottl. & Willd. (= *P. integrifolia* L., cf. A. Meeuse in Blumea V^1, 1942, 72) from which it distinctly differs by the non-prominent nerves without any trace of axillary domatia, and the enormous panicles.

A NEW SPECIES OF COMBRETUM FROM EAST BORNEO

by

A. W. EXELL

(British Museum [Nat. Hist.], Botany Department, London)

(Issued 18. XII. 1954).

Combretum kostermansii Exell, sp. nov.

Frutex scandens, ramulis primo fulvo-pilosis et tomentellis demum sparse pilosis, atro-rubris. Folia opposita breviter petiolata, petiolo 1—3 mm longo, piloso, lamina chartacea, ovata vel oblongo-ovata, basi cordata, apice acuminata, 2—7 × 1.8—3.6 cm, supra nitidula, costa media excepta pilosula fere glabra, subtus ad nervo adpresse pilosula, haud lepidota, costis lateralibus utrinsecus 3—6. Flores ⚥ protogyni, 4-meri, sessiles, albi, in paniculas terminales et axillares, rhachide fulvopiloso, bracteis filiformibus 3—4 mm longis fulvo pilosis dispositi. Receptaculum inferius 1—1.5 mm longum, dense pilosum, superius cupuliforme, 1.5 × 2.5 mm, pilosulum. Calycis lobi ovato-acuminati, 1 × 0.9 mm. Petala 4, late ovata, apiculata, 2 × 1.5 mm, pilosa. Stamina 8, biseriata, filamentis 2.5 mm longis, glabris, primi inflexis, antheris 1 mm longis glabris. Discus inconspicuus. Stylus 4 mm longus, glaber. Ovuli 2.

Borneo. E. Borneo, Loa Haur, west of Samarinda, alt. 60 m, 8. V. 1952: *Kostermans 6784* (L, *type*; fragment in BM).

Although on the specimens collected I have not discovered any glandular hairs, I feel fairly certain that this species should be placed in Sect. Glandulosae Engl. & Diels with C. nigrescens King. Although a wide view of the latter species has been taken in Flora Malesiana (ser. I, vol. 4: 538. 1954), the specimen Kostermans 6784 seems to diverge so considerably, especially in the shape and size of the leaves, the absence of glands and the much larger petals, that I have had to describe it is new.

SUR LA VEGETATION D'ALGUES MARINES DE LA ZELANDE
(Pays-Bas)

par

JOSEPHINE TH. KOSTER

(Rijksherbarium, Leyde).

En Zélande, province des Pays-Bas, l'on trouve différentes stations où croissent des algues marines. Ce sont:

1. Les digues,
2. Les canaux d'eau de mer,
3. Les parcs à huîtres,
4. Les slikkes et les schorres.

La Zélande comprend une bande continentale et deux séries d'îles. Comparé aux autres provinces des Pays-Bas, le climat est assez tempéré. La température moyenne à Flessingue (Vlissingen) est de 3°C en janvier, le mois le plus froid, et de 18°C durant les mois les plus chauds, juillet et août. La température moyenne de l'eau de mer en surface est de 1—3°C en janvier et de 19°C en juillet et août.

La formation des îles a commencé au IXe siècle. Depuis le IIe siècle environ, la mer traversait les dunes côtières, dans la région, où se trouvent les îles de la Zélande aujourd'hui, et inondait la tourbière qui se continuait à l'arrière, la dévastant en partie. A l'origine des îles, était un banc de sable ou d'argile, limité, puis agrandi grâce à l'endiguement des alluvions vaseuses. Aujourd'hui, l'on fait encore la même chose: on gagne de la terre nouvelle qui, bien que protégée par les digues, se perd de temps en temps en période des dangereuses marées de vive-eau, génératrices de catastrophes, d'où rupture des digues et inondation. Il faut alors reconquérir ces terres. Dès le XIVe siècle, on renforçait les digues, qui étaient construites de sable et d'argile par des poteaux de bois aux endroits les moins solides. Depuis 1730 les dégats des tarets, si dangereux pour les poteaux, ont provoqué la construction de jetées inclinées, formées de blocs de pierres naturelles ¹). Les digues les plus récentes, qui datent de 1916, sont renforcées par des murs de béton. On peut considérer ces pentes de pierres naturelles comme des roches côtières artificielles. Cependant leur âge ne les rendent pas comparables aux roches côtières en place, parce que ces digues ne datent que de 1730 et que leur réparation, de temps à autre, entraîne la disparition de la végétation, qui les couvre.

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¹) Communication de M. S.-J. Fockema Andreae, secr. "Hoogheemraadschap" de Rijnland (Leyde).

La vitesse avec laquelle certaines espèces de cette flore s'établissent en lieux propres, a été démontrée après les ruptures de digues et les inondations tragiques, consécutives à la grande marée et à la tempête à la fois, dans la nuit du 31er janvier au 1er février 1953. Durant la nuit fatale, la hauteur du niveau supérieur de la mer en furie surpassait les prévisions de 2,50 à 3,30 m. Quatre-vingts pour cent de la terre de l'île Schouwen étaient inondées. Deux mois après la catastrophe on trouvait déjà une végétation dense de jeunes *Enteromorpha* et de Diatomées dans les rues de Zierikzee, vieille ville de la côte méridionale de Schouwen. Le 4 juin 1953, l'édification des nouvelles clôtures auprès de Zierikzee était achevée. Dès l'été, apparaissaient des algues de la zone sublittorale de la côte sud de Schouwen. Huit mois après le cataclysme, *Ceramium rubrum* (Huds.) Ag. dominait, montrant un abondant développement aux abords de Zierikzee. On l'a trouvé dans le canal et sur le sol, fixé à un pont de béton, à une auge de fer, à des restes d'herbes et des roseaux et à des arbustes morts. On a observé *Pylaillella littoralis* (L.) Kjellm., *Ectocarpus, Aglaothamnion furcellariae* (J. Ag.) G. Feldm.-Maz. (= *Callithamnium furcellariae* J. Ag.)

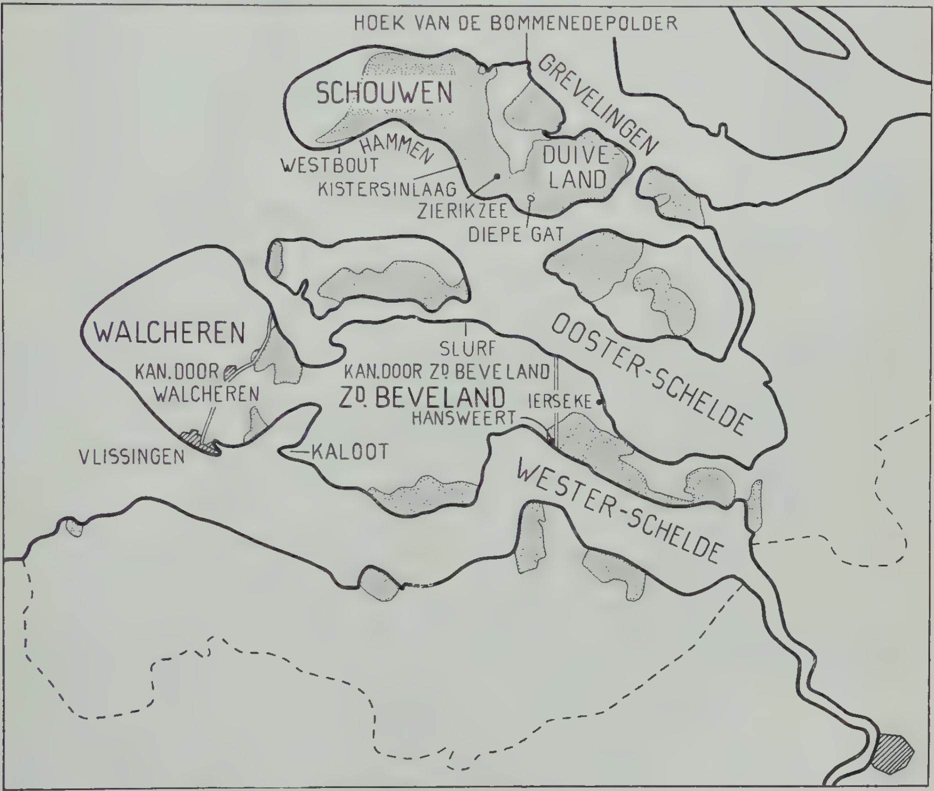

Fig. 1. La Zélande, avec les stations figurant dans le texte. Les régions pointillées étaient inondées au 1er février 1953.

et *Antithamnium cruciatum* (Ag.) Naeg. au bord des chemins sur des restes d'herbes et des roseaux. Toutes ces algues croissaient dans l'eau de mer. *Porphyra umbilicalis* (L.) Kütz. et *Enteromorpha clathrata* (Roth) Grev. poussaient sur les débris pierreux d'une maison éboulée, mais aussi sur le sol dans les chemins, comme de même *Ulva lactuca* L. Dans les champs, on ne trouvait pas d'algues, sauf quelques *Enteromorpha*. C'est à l'ancienne végétation, reliquats d'herbes, de roseaux, d'arbustes et d'arbres et aux pierres que les algues se fixaient. Fin novembre 1953, quand les polders se sont asséchés, toutes ces algues ont disparu.

Les Diatomées, trouvées d'octobre à novembre 1953, aux abords de Zierikzee, fixées à *Ceramium rubrum*, *Callithamnium furcellariae*, *Chaetomorpha linum* et des reliquats d'herbes, des roseaux et des arbustes sont déterminées par M. A. van der Werff. Il y avait les espèces suivantes: *Biddulphia aurita* (Lyngb.) Bréb. et God. (rare), *Cocconeis scutellum* Ehr., *Diploneis didyma* Ehr. (très rare), *Grammatophora marina* (Lyngb.) Kütz. (très commune), *Gyrosigma balticum* (Ehr.) Rabh. (très rare), *Melosira moniliformis* (Müll.) Ag. (commune), *M. nummuloides* (Dillw.) Ag. (très commune), *Navicula digitato-radiata* (Greg.) A. S. (rare), *N. crucicula* (W. Sm.) Donk. (très rare), *N. crucigera* (W. Sm.) Cl. (rare), *N. rostellata* Kütz. (très rare), *Nitzschia acuminata* (W. Sm.) Grun. (très rare), *N. angularis* W. Sm. (très rare), *N. apiculata* (Greg.) Grun. (très rare), *N. punctata* (W. Sm.) Grun. (très rare), *N. sigma* (Kütz.) W. Sm. (rare), *Opephora marina* (Greg.) Petit (très rare), *Raphoneis amphiceros* Ehr. (très rare), *R. surirella* (Ehr.) Grun. (très rare), *Rhabdonema minutum* Kütz. (très rare), *Surirella gemma* Ehr. (très rare), *Synedra tabulata* (Ag.) Kütz. et sa var. *fasciculata* (Kütz.) Grun. (commune).

Le Vierbannenpolder à Duiveland, à l'est de Zierikzee, était le dernier parmi les polders inondés, où les ruptures des digues ont été réparées. Jusqu'à la complète réfection des digues, le 6 novembre 1953, ce polder était encore régulièrement inondé pendant les marées hautes. Auprès de "Diepe Gat", on trouvait partout, en grande abondance, *Enteromorpha clathrata* (Roth) Grev. et *Blidingia minima* (Naeg. ex Kütz.) Kylin, croissant entre les niveaux des marées à même le sol dans les chemins, fixées aux objets de bois, à des fils de fer, aux arbustes et de jeunes exemplaires stériles de *Fucus vesiculosus* L. dans les sentiers et sur les pentes d'une digue intérieure. Après la clôture des digues, les deux espèces de Chlorophycées ont été rencontrées, croissant hors de l'eau depuis déjà longtemps. On trouvait également d'autres espèces, surtout de la zone sublittorale, prospérant dans l'eau, sur les restes d'herbes et des roseaux, au bord des chemins et des fossés, quelquefois dans le chemin même: *Enteromorpha clathrata*, *E. ahlneriana* Bliding, *Ulva lactuca* L. (aussi dans les champs), *Bryopsis plumosa* (Huds.) Ag., *Chaetomorpha linum* L., *Dictyota dichotoma* (Huds.) Lamour., *Ectocarpus confervoides* (Roth) Le Jol., et son var. *arctus* (Kütz.) Kjellm., *E. siliculosus* (Dillw.) Lyngb., *Giffordia sandriana* (Zanard.) Hamel, *Pylaiella littoralis* (L.) Kjellm., les Ectocarpacées avec des sporanges pluriloculaires, *Ceramium rubrum* (Huds.) Ag., *Antithamnium cruciatum* (Ag.) Naeg., *Aglaothamnion furcellariae* (J. Ag.) G. Feldm.-Maz., *Hypoglossum woodwardii* Kütz., *Polysiphonia nigrescens* (Huds.) Grev.. Toutes ces algues étaient immergées. A cette époque, des quantités énormes de Diatomées couvraient les voies de parcours, les murs, les objets en bois, les herbes, les algues, tous les matériaux submergés.

Avec la vidange des polders, toutes ces algues ont péri.

M. A. van der Werff, qui a déterminé les Diatomées, récoltées de novembre à décembre 1953, auprès de "Diepe Gat" dans le Vierbannenpolder, a trouvé les espèces suivantes: *Achnanthes brevipes* Ag., *Bacillaria paradoxa* Gmel., *Biddulphia aurita* (Lyngb.) Bréb. et God., *Cocconeis pediculus* Ehr., *C. scutellum* Ehr., *Cyclotella striata* (Kütz.) Grun., *Grammatophora marina* (Lyngb.) Kütz., *Hantzschia amphioxys* (Ehr.) Grun., *Licmophora* spec., *Melosira moniliformis* (Müll.) Ag. (commune), *M. nummuloides* Meun., *M. sulcata* (Ehr.) Kütz., *Navicula cruciculoides* Brockm., *N. crucigera* (W. Sm.) Cl., *N. digitato-radiata* (Greg.) A. S., *Nitzschia angularis* W. Sm., *N. navicularis* (Bréb.) Grun., *N. punctata* (W. Sm.) Grun., *N. sigma* (Kütz.) W. Sm., *Pleurosigma angulatum* (Queck.) W. Sm., *P. elongatum* W. Sm., *Rhabdonema minutum* Kütz. (commun), *Schizonema grevillei* Ag., *Scoliopleura tumida* (Bréb.) Rabh., *Synedra gaillonii* (Bory) Ehr., *S. tabulata* (Ag.) Kütz. (commune).

1. La végétation algale des digues de l'île Schouwen a été observée dans trois stations, en mai 1952. Les pentes y sont assez rapides. Elles sont construites de blocs de basalte. Aux grandes marées, l'amplitude du changement de niveau de l'eau est de 3 m, aux mortes-eaux de 1,20 à 2,30 m. Deux de ces pentes, situées sur la côte sud, sont exposées au sud-ouest. En Zélande, les vents dominants sont du sud-ouest, puis de l'ouest, de sorte que, souvent, des brisants violents battent les digues sur les stations observées. La salinité de l'eau est de 25—30 $^{0}/_{00}$ au bras de mer Hammen qui baigne les digues étudiées.

I. — A l'ouest de Zierikzee, auprès de Kistersinlaag, il y avait la végétation suivante sur la pente de la digue.

Une ceinture de *Pelvetia canaliculata* (L.) Decne et Thur., fructifère, haute de 2,50 m environ, comprenait la zone d'humectation et se continuait, au bas, dans la partie supérieure de la zone littorale. Au sommet, les plantes étaient entièrement desséchées.

A la base de la ceinture de *Pelvetia,* sur une partie de la pente assez plane se trouvait une ceinture de plantes courtes et fructifères de *Fucus vesiculosus* L., haute de 2,50 m environ. Les plantes étaient fixées à des pierres et à des balanes.

Entremêlés, vers le fond, à des plantes de *Fucus vesiculosus,* on notait des spécimens, petits et mal développés, de *Chondrus crispus* (L.) Stackh., quelques *Gigartina stellata* (Stackh.) Batt. et un grand nombre de *Dumontia incrassata* (Müll.) Lamour., tous attachés aux pierres. Les *Chondrus crispus* plus bas étaient plus luxuriants et se trouvaient au milieu d'un grand nombre de *Codium fragile* (Sur.) Hariot, avec les épiphytes *Ceramium rubrum* (Huds.) Ag., *Ectocarpus confervoides* (Roth) Le Jolis (en exemplaires petits, d'environ 1 cm de haut), et son var. *arctus* (Kütz.) Kjellm., les *Ectocarpus* avec des sporanges pluriloculaires. Au niveau de la marée basse et légèrement au-dessous, l'on trouvait, fixées au bord des pierres, les espèces suivantes, toutes en abondance: *Bryopsis plumosa* (Huds.) Ag., *Cladophora rupestris* (L.) Kütz., avec l'épiphyte *Erythrocladia subintegra* Rosenv., *Vaucheria* (stérile), *Ulva lactuca* L., qui croissait le plus bas, *Polysiphonia nigrescens* (Huds.) Grev., *Ceramium rubrum* (Huds.) Ag., en exemplaires robustes portant, comme l'espèce précédente: *Pylaiella littoralis* (L.) Kjellm. et des Diatomées, puis *Ceramium deslongchampsii* Chauv. et *Aglaothamnion furcellariae* J. Ag.. *Chromastrum secundatum* (Lyngb.) Papenf. (= *Chantransia virgatula* (Harv.) Thur. f. *secundata* (Lyngb.) Rosenv.), poussait sur le Polypier *Dynamena pumila* (L.)[1]. Sur un seul bloc de basalte, se présentait *Enteromorpha compressa* (L.) Grev..

Pendant l'année 1950, d'autres espèces ont encore été trouvées par divers collecteurs, aux environs de la station observée: *Ascophyllum nodosum* (L.) Le Jolis, avec *Catenella repens* (Lightf.) Batt. entremêlé, *Fucus serratus* L. et au niveau de la marée basse, *Hypoglossum woodwardii* Kütz., *Lithothamnium lenormandii* (Aresch.) Fosl., *Polysiphonia denudata* (Dillw.) Kütz. (= *P. variegata* (Ag.) Zanard.), *Dictyota dichotoma* (Huds.) Lamour., et, dans la zone sublittorale, par 0,50 à 1 m de profondeur: *Phyllophora membranifolia* (Good et Woodw.) J. Ag. au pied de *Codium fragile* (Sur.) Hariot, *Griffithsia devoniensis* Harv. (très rare) et *Cladostephus spongiosus* (Lightf.) Ag..

En avril 1954, après un hiver assez rigoureux, la végétation algale de la digue auprès de Rengerskerke, station située un peu à l'ouest de Kisterslnlaag et exposée au sud-ouest, était la suivante.

Les ceintures de *Pelvetia canaliculata* (L.) Decne et Thuret, fructifère, et de *Fucus vesiculosus* L., fructifer, ne comptaient pas plus de quelques plantes. Les plantes de *Fucus vesiculosus* n'avaient pas de vésicules. *Blidingia minima* (Naeg. ex Kütz.) Kylin couvrait quelques blocs de basalte dans la partie la plus haute de la zone littorale.

La végétation d'un môle, situé dans la zone littorale, exposé à l'ouest et construit pêle-mêle de blocs de basalte, était composée d'*Enteromorpha compressa* (L.) Grev., entremêlée d'*Ulothrix flacca* (Dillw.) Thuret, de *Porphyra umbilicalis* (L.) Kütz. et d'*Ectocarpus confervoides* (Roth) Le Jolis, toutes croissant à la surface des blocs. Des plantes de *Fucus vesiculosus* L., sans vésicules, étaient attachées au côté supérieur des blocs. Quelques exemplaires d'*Ascophyllum nodosum* (L.) Le Jolis étaient fixés au côté inférieur des blocs. Des branches mortes qui se trouvaient entre les blocs étaient couvertes d'une association d'*Ulothrix flacca* (Dillw.) Thuret et d'*Urospora penicilliformis* (Roth) Aresch..

II. — A l'angle sud-ouest de Schouwen, dit Westbout, ouest de Burghsluis, la végétation algale sur une digue saillante, exposée au sud-ouest, était ainsi constituée. Au sommet de la zone littorale, on notait une ceinture dense de *Fucus vesiculosus* L., haute de 4 m environ; les plantes étaient courtes avec le thalle le plus souvent étroit (large de 17 mm) et peu de vésicules, donc, une forme caractéristique des stations exposées. La ceinture se continuait en dessous par des exemplaires clairsemés sur une partie de la pente plus faible, haute de 3 m environ.

Au niveau de la marée basse sur la portion la moins déclive croissait *Fucus serratus* L., en petit nombre, le thalle étroit (0,50 à 1 cm de large). Il est vrai que cette espèce préfère souvent une station presque plane, mais il est possible que les brisants soient ici trop forts. Apparaissaient au même niveau *Enteromorpha compressa* (L.) Grev., *Ulva lactuca* L. (à la surface des pierres), peu de *Porphyra umbilicalis* (L.) Kütz. et, ensuite en magnifiques exemplaires: *Chondrus crispus* (L.) Stackh., *Ceramium rubrum* (Huds.) Ag., *C. deslongchampsii* Chauvin, avec des tétraspores, et *Polysiphonia nigrescens* (Huds.) Grev..

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[1] Détermination du Dr W. Vervoort (Leyde).

De l'autre côté de la même digue il y avait seulement *Fucus vesiculosus* L., en ceinture dense, d'une hauteur de 6 m environ.

Durant 1950, d'autres espèces ont été trouvées auprès de la station examinée par des collecteurs divers: *Pelvetia canaliculata* (L.) Dene et Thur., avec *Catenella repens* (Lightf.) Batt., entremêlées, croissant dans les fentes, entre les pierres, *Ascophyllum nodosum* (L.) Le Jolis et, au niveau de la marée basse et plus bas jusqu'à une profondeur de 1 m: *Cladophora rupestris* (L.) Kütz., *Cl. flexuosa* (Griff.) Harv., *Bryopsis plumosa* (Huds.) Ag., *Lithothamnium lenormandii* (Aresch.) Fosl., *Hypoglossum woodwardii* Kütz. et *Cladostephus spongiosus* (Huds.) Ag..

Les ceintures de Fucacées, connues de la zone littorale des côtes atlantiques de l'Europe ne sont pas toutes présentes dans les stations observées de la digue sud de Schouwen. *Ascophyllum nodosum* et *Fucus spiralis* y manquent. Cependant, ces espèces existent sur la côte sud de Schouwen. Absent aussi est *Himanthalia elongata* (L.) S. F. Gray, espèce qui est caractéristique des côtes rocheuses à faible pente, baignées de brisants forts. Cette espèce croît le plus souvent un peu plus haut que le niveau moyen de la marée basse, bien qu'elle ait été observée au Skagerak jusqu'à une profondeur de 4 m (Printz.). *Himanthalia elongata* est abondante sur les côtes rocheuses de la Grande-Bretagne et de la France (côte atlantique). Mais bien que des pieds ou des plantes entières fructifères soient apportés par le flot, après les tempêtes du sud-ouest, jusqu'à présent l'espèce n'a pas été observée à l'état fixé sur les côtes des Pays-Bas.

III. — A l'angle nord-est de Schouwen, dit Hoek-van-de-Bommenedepolder, les ceintures de Fucacées sont plus complètes. La pente de la digue, du côté de la mer, est exposée à l'est. La direction du vent dominant étant sud-ouest, l'eau du bras de mer Grevelingen est normalement assez calme. La salinité est ordinairement de 27 $^0/_{00}$, mais elle peut tomber jusqu'à 11 $^0/_{00}$, lorsque sont élevés les niveaux des rivières communicantes. [1])

Dans la zone littorale, on trouve les ceintures suivantes, de haut en bas (fig. 2):

Pelvetia canaliculata (L.) Decne et Thur., des plantes bien développées et fructifères, formant une ceinture de 20 à 30 cm de haut.

Fucus spiralis L., plantes fructifères courtes avec le thalle assez faible et étroit (0,50 cm environ de large), formant une ceinture d'une hauteur égale à la précedente.

Ascophyllum nodosum (L.) Le Jolis, plantes bien développées et fructifères, formant une ceinture de 5 m environ.

Fucus vesiculosus L., sur une partie de la pente moins rapide, en pieds clairsemés, luxuriants, avec le thalle 0,50 à 1 cm de large, avec des réceptacles très variables, arrondis aussi bien que pointus. L'espèce forme une ceinture haute de 2,50 m environ.

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[1]) Communication du Département de l'Hydrographie (La Haye).

La végétation des digues de la Zélande doit être originaire principalement des roches côtières de la Manche. Le Gulfstream venant de la côte sud-est de l'Amérique du Nord déploie une ramification qui passe par la Manche et atteint la côte néerlandaise. Après les tempêtes du sud-ouest, des touffes de Fucacées souvent grandes et fructifères, couvertes d'épiphytes, et d'autres objets transporteurs d'algues, comme les bottes de liège venues des côtes de la Manche, des poutres, etc., sont jetés sur les côtes néerlandaises. Ainsi peut s'établir la végétation algale des digues.

2. Les canaux qui traversent Walcheren et Zuid-Beveland et qui font communiquer des bras de mer, forment aussi des stations artificielles pour les algues marines. Ces canaux sont séparés des bras de mer par des écluses. Les marées n'y sont pas perceptibles. En été, on abaisse le niveau de l'eau pour contrôler les parois, de sorte que les Rhodophycées ordinairement submergées meurent jusqu'au pied à cause de l'ensoleillement. La salinité de l'eau dans ces canaux est variable; celle de l'eau des bras de mer, dont ils assurent la communication, est de 25—32 $^{0}/_{00}$ pour l'Oosterschelde inférieur et de 27—32 $^{0}/_{00}$ pour le Westerschelde, auprès de Flessingue 1), en connexion par le Kanaal-door-Walcheren, de 24—30 $^{0}/_{00}$ pour l'Oosterschelde supérieur, auprès de Ierseke, et de 16—26 $^{0}/_{00}$ pour le Westerschelde, auprès de Hansweert 1), en connexion par le Kanaal-door-Zuid-Beveland. De temps en temps, l'on y fait affluer l'eau des polders dans les canaux et, lorsque l'on y procède après une période de pluie, la salinité peut tomber notablement, jusqu'à 5—6 $^{0}/_{00}$ dans le Kanaal-door-Walcheren 2). Pour cette raison, la flore d'algues est assez variable. La température de l'eau est de ± 5°C plus élevée que celle des bras de mer 1).

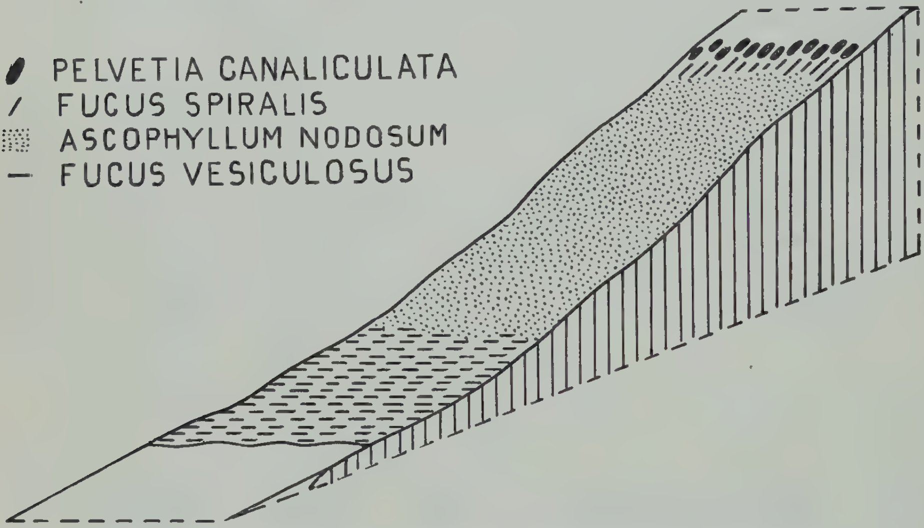

Fig. 2. Les ceintures des Fucacées au Hoek-van-de-Bommenedepolder.

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1) Communication de l'Ingr W. G. Beeftink.

2) Communication de M. C. Brakman.

Sur les parois de ces canaux croissent des algues marines, qui préfèrent une station abritée et qui, euryhalines, peuvent endurer une chute de la salinité de l'eau, dans laquelle elles vivent. A cause de l'ensoleillement, le bord ouest est une meilleure station pour les algues que le côté opposé ainsi qu'on l'a constaté [1]).

Au-dessous du niveau ordinaire de l'eau dans ces canaux, par une profondeur de 0,25 à 1,50 m, là où la pente est très adoucie, poussent sur les blocs de pierre, des Rhodophycées, comme *Gracilaria verrucosa* (Huds.) Papenf. (= *Gr. confervoides* (L.) Grev.), *Polysiphonia urceolata* (Lightf.) Grev., *P. denudata* (Dillw.) Kütz., *Aglaothamnion furcellariae* (J. Ag.) G. Feldm.-Maz., *Antithamnium cruciatum* (Ag.) Naeg., *Griffithsia devoniensis* Harv. et, en outre, dans le Kanaal-door-Walcheren, *Callithamnium corymbosum* (Sm.) Lyngb., *Ceramium diaphanum* (Lightf.) Roth et dans le Kanaal-door-Zuid-Beveland, un des canaux de plus fort trafic en Europe, *Polysiphonia nigrescens* (Huds.) Grev., *Dasya pedicellata* (Ag.) Ag., une ceinture dense de *Chondrus crispus* (L.) Stackh., jusqu'à une profondeur de 0,50 m [1]), *Ceramium deslongchampsii* Chauv.. Sur les parois de ces canaux ont été observées des Chlorophycées sur une profondeur de 0,25 à 1 m, comme *Bryopsis plumosa* (Huds.) Ag., *Enteromorpha compressa* (L.) Grev., *E. linza* (L.) J. Ag. (dans un canal de communication, dit Arnemuids Kanaal) et d'autres *Enteromorpha*, ensuite *Cladophora rupestris* (L.) Kütz. et *Cl. fracta* (Dillw.) Kütz. f. *hauckii* (Børgesen) Slootweg (dans le Kanaal-door-Walcheren). Dans le Kanaal-door-Zuid-Beveland, C. Brakman a noté une ceinture de *Fucus vesiculosus* L., sous le niveau de l'eau et, de plus, il y avait peu d'*Ascophyllum nodosum* (L.) Le Jolis.

Dans le Kanaal-door-Zuid-Beveland, ou trouvait directement au dessous du niveau ordinaire de l'eau, une ceinture 0,50 m de large, composée d'*Enteromorpha compressa* (L.) Grev. (dominante), *Monostroma wittrockii* Bornet et *Porphyra leucosticta* Thuret (C. den Hartog).

3. De même, les parcs à huîtres à Ierseke (Zuid-Beveland) forment des stations artificielles et abritées pour les algues marines. Ces parcs à huîtres sont construits dans des lieux abrités, sur la vase et sur les blocs de basalte du pied de la digue. Les algues y croissent, fixées à des pierres, des tuiles, des coquillages. A marée basse, l'eau atteint encore un niveau de 1 m. La salinité de l'eau est de 24—30 $^0/_{00}$. On y trouve des espèces des côtes plus méridionales, comme *Bryopsis plumosa* (Huds.) Ag., *Griffithsia devoniensis* Harv., *Gr. barbata* (Sm.) Ag., *Chondria dasyphylla* (Woodw.) Ag., *Ch. tenuissima* (Good. et Woodw.) Ag., *Taonia atomaria* (Woodw.) J. Ag., *Sphacelaria fusca* (Huds.) Ag., et encore quelques espèces de *Polysiphonia* (H. Veldkamp), *Antithamnium cruciatum* (Ag.) Naeg., *Hypoglossum woodwardii* Kütz., *Gracilaria verrucosa* (Huds.) Papenf. et beaucoup de *Dictyota dichotoma* (Huds.) Lamour.. Il est possible qu'un certain nombre de ces espèces aient été introduites par des huîtres importées de la côte bretonne.

Toutefois, une immigration spontanée des algues marines des côtes plus au sud est également possible. Une telle immigration dans les pays scandinaves a été rapportée en ces derniers temps (Printz.).

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[1]) Communication de M. C. Brakman.

Plus éloignés de la mer, on trouve des bassins remplis d'eau de mer et limités par des murs de béton, où l'on garde les huîtres adultes. Chaque jour on fait descendre l'eau pendant 5 heures, de sorte que les algues croissant sur les murs, dans la partie hors de l'eau durant cette période, sont celles de la zone littorale d'une côte atlantique rocheuse de l'Europe, telles que *Lyngbya semiplena* (Ag.) J. Ag. ex Gom., *Ralfsia verrucosa* (Aresch.) J. Ag., *Fucus vesiculosus* L., *Enteromorpha compressa* (L.) Grev. et *Chondrus crispus* (L.) Stackh.. D'autres espèces restent toujours submergées: *Ulva lactuca* L., *Codium fragile* (Sur.) Hariot, *Vaucheria* (stérile), *Chondrus crispus* (L.) Stackh., *Polysiphonia nigrescens* (Huds.) Grev., *Antithamnium cruciatum* (Ag.) Naeg., *Callithamnium corymbosum* (Sm.) Lyngb., *Aglaothamnion furcellariae* (J. Ag.) G. Feldm.-Maz., qui appartiennent principalement à la zone sublittorale. A la surface des murs, dans des lieux sablonneux, humectés de temps à autre par l'eau de mer, on trouve *Rhizoclonium riparium* (Roth) Harv.f. *implexum* (Dillw.) Rosenv. avec *Percursaria percursa* (Ag.) Rosenv., *Vaucheria* (stérile) et *Microcoleus chthonoplastes* Thuret ex Gom..

4. Les algues des slikkes et des schorres, des alluvions vaseuses, font partie de la végétation naturelle de la Zélande.

Les slikkes et les schorres existent dans les estuaires, en plusieurs endroits, le long de la Manche et de la Mer du Nord. La végétation halophile y est plus ou moins conforme (Jacquet).

Les slikkes et les schorres sont inondés régulièrement par l'eau de mer. On les appelle *schorres* quand ils sont inondés seulement pendant les marées de vive-eau et *slikkes* lorsqu'elles sont submergées à chaque marée haute (Massart). En Zélande, on trouve ces alluvions sablonneuses et argileuses à plusieurs endroits hors des digues. Nous avons visité, en octobre 1953, deux de ces alluvions dans l'île Zuid-Beveland, le Kaloot, l'angle du sud-ouest, et le Slurf, auprès de Sas-van-Goes, côte nord. Sur le Kaloot, érodé depuis longtemps, on ne trouve que des schorres. Sur le Slurf, il y a des parties qui sont des slikkes et d'autres, plus hautes, qui sont des schorres.

La salinité du sol des slikkes et des schorres est très variable du fait de l'insolation et de la pluie. Au mois le plus sec, février, le chiffre moyen des précipitations est de 42 mm et, au mois le plus humide, novembre, de 76 mm.

I. — La végétation d'une slikke argileuse, recouverte de vase contenant du sulfure de fer, partie du Slurf, était la suivante.

Sur les pieds vivants de *Spartina townsendii* H. et J. Groves, jusqu'à une hauteur de 5 cm, poussaient: *Bostrychia scorpioides* (Gmel.) Mont., en touffes denses, et *Fucus spiralis* L., fructifer, tandisque *Enteromorpha ramulosa* (Sm.) Hook. croissait sur les plantes mortes de *Spartina townsendii. Fucus vesiculosus* L. var. *lutarius* Chauvin se développait dans cette station à même la vase. Dans un autre endroit de la slikke, *Bostrychia scorpioides* vivait sur *Spartina maritima* (Curtis) Fern., tandisque *Fucus vesiculosus* var. *lutarius* et *Catenella repens* (Lightf.) Batt. prospéraient sur la vase parmi les *Spartina maritima* et *Salicornia europaea* L..

Catenella repens croît en Zélande aussi sur les digues dans la ceinture d'*Ascophyllum nodosum* et souvent dans celle de *Fucus spiralis* et même plus haute dans celle de *Pelvetia canaliculata.* Elle vit à l'ombre dans des trous, sur les poteaux courts parmi les blocs de pierre ou sur des briques. Le thalle de cette espèce est presque filiforme sur les slikkes.

II. — La végétation algale d'un schorre du Kaloot, qui était principalement sablonneux, offrait les espèces suivantes: *Bostrychia scorpioides* en grand nombre, en puissantes touffes sur les pieds de *Puccinellia maritima* (Huds.) Parl., *Chaetomorpha capillaris* (Kütz.) Børgesen et *Enteromorpha intestinalis* (L.) Link., sur la terre, parmi les Phanérogames: *Puccinellia maritima, Aster tripolium* L., *Limonium vulgare* Mill., *Triglochin maritima* L., *Salicornia europaea.* Dans une autre station du Kaloot, sur le sol argileux, se présentaient, parmi les Phanérogames, *Suaeda maritima* (L.) Drumm., *Puccinellia maritima, Armeria maritima* (Mill.) Willd. les espèces: *Rhizoclonium riparium* (Roth) Harv. f. *riparium* avec *Microcystis littoralis* (Hansg.) Forti et *Rivularia nitida* Ag. ex Born. et Flah.. Le même groupement d'algues est connu de la côte ouest de la Suède (Lindstedt) et (sans *Microcystis*) de la côte sud de la Bretagne (Priou et Serpette). Dans un endroit bas du Kaloot croissaient sur la vase, parmi *Salicornia europaea* et *Puccinellia maritima, Lyngbya aestuarii* (Mert.) Liebm. ex Gom. et *Microcoleus chthonoplastes* Thur. ex Gom. un groupement de Cyanophycées bien connu des sols salés, fréquent aussi sur les slikkes de Zuid-Beveland.

En Zélande on a observé *Bostrychia scorpioides* fixée sur d'autres Phanérogames halophiles, surtout *Obione portulacoides* (L.) Maq., aussi *Aster tripolium, Festuca rubra* L., *Suaeda maritima, Limonium vulgare.* Cette algue vit dans les mêmes conditions sur les côtes atlantiques de la France et de la Grande-Bretagne, souvent accompagnée de *Catenella repens.*

L'unique végétation d'un banc argileux, proche de la mer, reliquat d'un schorre érodé du Kaloot, était constitué par une couche de Diatomées et des groupes d'*Enteromorpha ahlneriana* Bliding.

Une flaque artificielle dans un schorre du Slurf contenait des Chlorophycées: *Enteromorpha clathrata* (Roth) Grev. avec l'épiphyte *Entophysalis conferta* (Kütz.) Drouet et Daily, *Enteromorpha ramulosa* (Sm.) Hook., *Lola implexa* (Harv.) Hamel, *Cladophora fracta* (Dillw.) Kütz. f. *hauckii* (Børgesen) Slootweg, *Chaetomorpha linum* (Müll.) Kütz.

Sur la vase argileuse d'une partie basse d'un schorre du Slurf, on pouvait voir des taches vert-noirâtres, lustrées, d'*Anabaena torulosa* (Carm.) Lagerh., parmi *Puccinellia maritima,* portant sur les pieds des touffes de *Bostrychia scorpioides.*

Une récolte de mai 1952 de W. G. Beeftink a montré encore d'autres *Chlorophycées* croissant sur les schorres du Kaloot et du Slurf. Sur les portions les plus hautes des tiges de *Spartina townsendii,* tout près d'une étendue de vase nue, figuraient *Blidingia minima* (Naeg. ex Kütz.) Kylin et *Ulothrix flacca* (Dillw.) Thur. La première de ces algues a été trouvée en grande quantité dans les plaines vaseuses des côtes de Norfolk (Chapman). Sur le sol vaseux, sous les Phanérogames halophiles, il y avait *Rhizoclonium riparium* (Roth) Harv., qu'on trouve aussi en grande abondance dans les vases salées des côtes de Clare Island (Cotton) et de Norfolk (Chapman), *Rh. kocheanum* Kütz., *Percursaria percursa* (Ag.) Rosenv., fréquente dans les terrains salés des côtes de Clare Island (Cotton), *Vaucheria*, *Chaetomorpha capillaris* (Kütz.) Børgesen, *Enteromorpha compressa* (L.) Grev. abondante dans les slikkes de la côte de la Belgique (Massart) et dans les plaines vaseuses salées des côtes de Clare Island (Cotton) et de Norfolk (Chapman), *E. jürgensii* Kütz., *E. torta* (Mert.) Reinb., connue aussi des stations similaires de Clare Island (Cotton) et de Norfolk (Chapman). Sur le sol vaseux croissaient aussi des Cyanophycées, comme *Lyngbya semiplena* (Ag.) J. Ag. ex Gom., *L. majuscula* (Dillw.) Harv. ex Gom., *Oscillatoria laetevirens* Crouan ex Gom., *O. brevis* Kütz. ex Gom., *Chroococcus turgidus* (Kütz.) Naeg. et *Merismopedia glauca* (Ehrenb.) Naeg. f. *mediterranea* (Naeg.) Coll.

Il nous reste l'agréable devoir d'exprimer notre vive reconnaissance au Dr Krien J. Hocke Hoogenboom (Schouwen) et à l'Ingr W. G. Beeftink (Zuid-Beveland), les guides-botanistes des excursions en Zélande; M. C. Brakman (Walcheren) qui, de 1940 à 1943, a observé la végétation algale marine de la Zélande et nous a fourni d'intéressantes données; à M. J. Viergever (Schouwen) qui nous a procuré les algues des contrées inondées, avec des observations sur leurs stations; au Dr P. Korringa (Bergen-op-Zoom) qui nous a communiqué les chiffres concernant la température et la salinité de l'Oosterschelde; au Dr H. ten Kate (Institut Météorologique, De Bilt) qui nous a donné des indications sur le climat; au Dr R. Salgues (Brignoles) qui a bien voulu corriger le texte de cette communication.

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NOTES ON DUTCH LICHENS

by

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(Issued 18. XII. 1954).

In Madroño (1936) Herre has lamented the disappearance of lichen species through the disastrous interference of man. Unavoidably, the advance of civilised modern life is linked with destruction of the vegetation. This applies all the more as the endangered area is more densely populated and it certainly applies most alarmingly to the lichen flora of the Netherlands. Here, every way-side tree felled is an irreparable loss to the epiphytic lichen communities, every acre of heath burnt or turned into arable land is a blow to our stock of terrestrial lichen species, whereas the use of dry fertilisers and the spraying of orchards are very effective in killing any lichen in the neighbourhood that otherwise might have survived. A comparison of the material preserved in the older collections with what can be found nowadays, clearly shows what has gone lost. It is sad to think that an ever increasing number of species are on their way to total extermination.

However, from a thorough investigation of the epiphytic communities of cryptogams latterly started by Mr J. J. Barkman, it becomes apparent that at least to some extent the losses may be compensated by the discovery of species hitherto overlooked or not recognised. It is on such and other finds that I intend to report from time to time.

It may seem an inconsistency that in the present paper the species have not been treated alike, some being quoted with more or less complete descriptions, others without any. The reason is that my lack of proficiency in crustaceous groups makes it desirable as yet to add the most distinctive characters, so as to render my identifications controllable by the reader. Obviously, for the information required, some species need a more detailed description than others.

With regard to the abbreviation of the herbaria, I may refer to my paper on *Parmeliaceae* (Maas Geesteranus, 1947).

I am very much indebted to the directors of the herbaria at Groningen and Utrecht for the loan of their material.

My best thanks are due to Dr O. Almborn, Lund, and to Dr A. H. Magnusson, Göteborg, for their kind help in critical cases.

ACAROSPORA Mass.

A. fuscata (Nyl.) Arn. — New to the flora.

Drente: Loon, 10 V 1941, *Maas G. 1121a,* on granite boulder of cairn, exposed (det. Magnusson) (L).

ARTHONIA Ach.

A. punctiformis Ach. — Thallus endophloeodal. Disc black, epruinose, up to 0.6 mm across. Hypothecium pallid. Spores colourless, vestigiiform (footprint-shaped), 4-celled, 13.8—17.7 × 4.9—7 μ.

Not previously recorded.

Friesland: Piaam, 18 VIII 1951, *Barkman 3107,* smooth bark of *Fraxinus excels.* (L).

Utrecht: Linschoten, Linschoterbos, 24 IV 1953, *Maas G. 9307,* smooth bark of *Juglans regia* (L).

Noord-Holland: Bergen, 't Hof, 23 IX 1943, *Barkman 642,* on *Fagus silv.* in wood (L); Texel, Oudeschild, 30 VIII 1951, *Barkman 3364,* smooth bark of *Fraxinus excels.* (L).

ARTHOPYRENIA Mass.

A. biformis (Borr.) Mass. — Thallus corticolous, greyish white. Perithecia black, up to 0.3 mm across. Excipulum black, carbonaceous, somewhat incompletely developed at the base. Asci cylindrical-clavate, 8-spored, (73)79—97(114) × 10—12 μ. Spores obliquely 1-seriate, frequently 2-seriate towards the top of the ascus, colourless, ellipsoidal, straight or somewhat fabiform, 2-celled, not or little constricted at the septum, cells not equally large, (10.8)12.8—16(16.8) × 4.9—6.5 μ. Paraphyses branched, anastomosing.

Von Keissler (1937. 172) in enumerating the differences of the present species from closely allied *A. sphaeroides,* points out that among others it should be possible to distinguish *A. biformis* from that species by the "an den Enden verschmälerten, spitzlich auslaufenden Sporen" and by "die Grünfärbung des Lagers wie des Hypotheciums durch Kalilauge". It should be noted, however, that spores with rounded ends are equally common, as could be checked in some of the exsiccata quoted by Von Keissler. As to the colour reaction with K, this may be so faint as to be hardly perceptible.

Abeleven (1898. 95) recorded the species as *Acrocordia polycarpa* Flk. from Amerongen only, whereas a good many finds appear to have been erroneously listed as *Microthelia micula* (l. c. 57), although most of them had been correctly identified as *Verrucaria biformis* by Van den Bosch (1853. 164). Other finds remained unobserved in a mixtum of various species, or were mistaken for other species. Altogether, *Arthopyrenia biformis* seems to have been of fairly common occurrence in former days, favourably contrasting with the single find of recent times.

Friesland: Veenwouden—Zwaag-Westeinde, 12 XII 1869, *Sprée,* on *Salix* (NBV).

Groningen: Groningen, no date, *Acker Stratingh,* on *Fraxinus* (Gro); no date, *Van Hall* (NBV); Haren, no date, *Acker Stratingh,* on *Salix* (Gro).

Overijsel: Dalfsen, 16 X 1951, *Barkman 4135,* on *Juglans* in orchard (det. Almborn) (L); Kampen, no date, *Bondam,* on *Fraxinus* (NBV); IJselmuiden, no date, *Bondam,* on *Salix* (L).

Utrecht: Amerongen, 8 VI 1862, *Sprée*, on *Castanea* (L, NBV); near Utrecht, no date, *Van der Sande Lacoste*, on *Salix* (NBV); Utrecht, 1841, 1842, *Van der Sande Lacoste*, on *Salix* (NBV); Zuilen, 1841, *Van der Sande Lacoste*, on *Fraxinus* (L).

Noord-Holland: Amsterdam, XI 1848, 1849, *Van der Sande Lacoste*, on *Ulmus* (NBV); Amsterdam, Verwerspad, IV 1849, *Van der Sande Lacoste*, on *Tilia* (NBV).

Zuid-Holland: Leiden, no date, *Van den Bosch*, on *Quercus* (L); Rijnsburg, no date, *De Haan* (NBV); Wassenaar, 31 VII 1922, *Ten Kate* (L).

Zeeland: Zuid Beveland: locality not specified, no date, *Van den Bosch*, on *Ulmus* (NBV); Goes, no date, *Van den Bosch*, on *Salix* (Gro), on *Ulmus* (NBV); Kloetinge, 1843, *Van den Bosch*, on *Salix* (NBV); Zwake, 1841, *Van den Bosch*, on *Pirus malus* (NBV); VIII 1841, *Van den Bosch*, on *Populus* (NBV).

Noord-Brabant: Breda, 1841, *Van der Sande Lacoste*, on *Salix* (NBV); Cromvoirt, 3 XII 1904, *Wakker*, on *Fraxinus* (L); Engelen, Engelepse Veer, 5 XII 1906, *Wakker*, on *Salix* (L).

ARTHOTHELIUM Mass.

A. dispersum (DC.) Mudd — Thallus greyish white. Apothecia up to 1 mm across, with irregular radiations, disc black. Hymenium J + bluish. Spores colourless, muriform, ovoid-ellipsoidal, 20—24.6 × 9.9—10.8 μ.

New to the flora.

Noord-Brabant: Cuik, Coebax, 2 VI 1907, *Wakker*, on *Quercus* (L).

A. ruanideum (Nyl.) Arn. — Thallus olivaceous. Apothecia 0.2—1 mm, with black, irregularly lobate disc. Hymenium J + vinaceous. Spores colourless, muriform, ovoid-ellipsoidal, 17.7—19.7 × 6.9—8.8 μ.

New to the flora.

Overijsel: Delden, Twickel, 18 X 1951, *Barkman 3368*, on *Fraxinus* in wood (L).

BACIDIA (De Not.) A. Zahlbr.

B. acerina (Nyl.) Arn. — Apothecia black-brown, somewhat constricted at the base. Epithecium fuscous, K + vinaceous. Hymenium colourless, 70—90 μ, J + blue. Hypothecium pallid. Spores colourless, acicular, 14—16-celled, 55—67 × 1.5—3.9 μ.

Vainio (1922. 147) in his monographic treatment of the Finnish lichens differentiates *B. acerina* (= *subacerina*) from *B. arceutina* by the way the apothecium is attached to the thallus. It is "bene constricta" at the base in the former, broadly adnate in the latter. As for this character, our specimen might be referred to *B. arceutina*, but the broader and more-celled spores make it probable that the present collection rather belongs to *B. acerina*.

New to the flora.

Friesland: Veenklooster, 14 VIII 1951, *Barkman 3359*, on *Fagus* (L).

B. arceutina (Ach.) Arn. — Apothecia fuscous, broadly adnate. Epithecium olive-brown in one collection, fuscous in the other, K —. Hymenium colourless, 60—70(—75?) μ, J + blue. Hypothecium pallid to dingy yellowish. Spores colourless, acicular, immature and obscurely septate in one collection, 7—8-celled in the other, straight to somewhat flexuous, 41.4—59.1 × 1.5—2 μ.

B. acerina (= *subacerina*), "*subacerina* subsp. *laurocerasi*" and *arceutina* as described in Vainio's Lichenographia (1922) form a group of closely related species whose delimitation does not seem established at all.

In both our collections, the specimens have the negative reaction of the epithecium upon K in common which, in connection with the broadly adnate apothecia, would point to subsp. *laurocerasi*. On the other hand, it is significant that the spores are narrower than in that subspecies, the width of the spores in *laurocerasi* being given as 2.5—4.5 μ. It depends, of course, on which character one is inclined to give preponderance whether the present specimens are to be regarded as *laurocerasi* or *arceutina*. Dr Magnusson, whom I sent our material for revision, is in favour of *B. arceutina*, but admits the choice to be difficult.

Another discrepancy lies in the paraphyses which Vainio in both species and subspecies mentioned describes as simple, whereas I found them sparingly but distinctly furcate towards the apex.

New to the flora.

Zuid-Holland: Rozenburg: De Beer, 12 IV 1952, *Barkman 2923*, on *Sambucus nigra* in the dunes (L); Voorne: Oostvoorne, Mildenburg, 2 V 1953, *Barkman 4151b*, on *Ulmus* in wood (L).

The following collection seems even more intermediate between *arceutina* and *laurocerasi* on account of its spores being slightly broader (up to 2.5 μ) than usual for the former.

Zuid-Holland: Voorne: Rockanje, Brede Water, 3 V 1953, *Maas G. 9388*, on *Salix repens* in the dunes (L).

B. laurocerasi (Del.) A. Zahlbr. — Apothecia fuscous, broadly adnate. Epithecium yellowish brown to fuscous, K —. Hymenium colourless, ± 75 μ, J + blue. Hypothecium pallid. Spores colourless, fusiform-acicular, with one end more attenuate than the other, immature, hardly septate (once seen to be 6-celled), 47.3—53.2 × 2.9—3.9 μ.

The specimens seem to belong to the present species on account of their broad spores, although I failed to observe that, as Vainio (1922. 176) has it, "paraphysibus apice crassioribus et hypothecio magis colorato a *B. subacerina* differt".

For the time being *laurocerasi* is used as a specific epithet, although Vainio is probably right in writing "non est autonoma species". It is no use, however, to venture a new combination as long as the whole group is so much in need of a revision.

New to the flora.

Zuid-Holland: Voorne: Rockanje, Windgat, 3 V 1953, *Maas G. 9381*, on *Salix* sp. in coppice (L).

B. muscorum (Sw.) Mudd — Apothecia black-brown to black. Epithecium dark blue-green to blackish green. Hymenium colourless below, gradually taking on the epithecial colour further upward, 55—60 μ, J + blue, turning vinaceous. Hypothecium rufous-fuscous. Parathecium dingy vinous red-brown. Spores colourless, acicular, 4—9-celled, straight or somewhat curved or flexuous, 31.5—45.3 × 1.5—3 μ.

Under the synonym of *Raphiospora viridescens* Mass. Abeleven (1898. 44) recorded the species from 2 localities in the dunal region, viz. near Bloemendaal and near Overveen. It appears that from the former locality there are 2 collections, one of which actually is this species, whereas the other is *Bacidia lignaria* (Ach.) Lettau. *Bacidia muscorum* seems to be rare in this country, although it may have been overlooked.

Noord-Holland: Bloemendaal, no date, *Buse & Gildemeester-Buse*, on mosses and sand (NBV); Overveen, no date, *Van Hall*, overgrowing mosses on sand (NBV).

Zuid-Holland: Voorne: Oostvoorne, 2 V 1953, *Maas G. 9344*, overgrowing mosses and vegetable debris on sand in the dunes (L).

Noord-Brabant: 's Hertogenbosch-Meerwijk, 21 V 1905, *Wakker*, no date, on fragment of brick among tiny mosses (L).

Limburg: St. Pietersberg, south of Maastricht, 24 V 1950, *Westhoff*, overgrowing mosses (L).

B. naegelii (Hepp) A. Zahlbr. — Thallus greyish, verruculose, esorediate. Apothecia fuscous or partly also ochraceous yellow-brown variegated, broadly adnate. Hypothecium pallid. Spores colourless, fusiform-ellipsoidal, 2—4-celled, occasionally also 6-celled, somewhat curved, 17.7—23.5 × 5.5—6 μ. Paraphyses closely coherent, not gelatinised.

New to the flora.

Zuid-Holland: Wassenaar, 11 V 1952, *Barkman 2963*, on *Populus* sp. in the dunes (L).

Noord-Brabant: Esch, 5 I 1906, *Wakker*, on deciduous tree (L); 's Hertogenbosch, fort Isabel, 10 XII 1904, *Wakker*, on *Ulmus* (L).

B. subincompta (Nyl.) Arn. — Apothecia black. Epithecium blue-green to blackish green. Hymenium colourless in the lower part, ± 50 μ, J + blue, turning vinaceous. Hypothecium dingy red-brown. Spores cylindrical to acicular, 4—6-celled, straight or somewhat curved, 19.7—27.6 × ± 2 μ.

New to the flora.

Gelderland: Elspeet, Vierhouter bos, 25 IV 1951, *Barkman 3406*, on *Fagus* in wood (L).

B. trisepta (Naeg.) A. Zahlbr. — Thallus grey-green, verrucose to granular. Apothecia dark fuscous to black, hemispherical, broadly adnate. Epithecium blue-green to blackish green or dark fuscous or discoloured in places, K —. Hymenium colourless or aeruginose, 73—83 μ, J + blue or at first pale vinaceous, then blue. Hypothecium pallid to pale fuscous. Asci clavate or somewhat saccate, 8-spored, 50—80 × 12—20 μ. Spores colourless, ellipsoidal—fusiform, 4-celled, with the apices obtuse or acute, 15.8—25 (31) × 5—7 μ. Paraphyses conglutinate, simple or furcate, septate, with somewhat incrassate apices.

Abeleven (1898. 41) reported the find of *Bilimbia miliaria β saxicola* Kbr., collected by Van Hall near Rheden. This name stands as a synonym for *Bacidia trisepta* f. *saxicola*, but examination shows the specimen to be poorly developed. No spores could be found and for the time being I regard the determination as dubious.

New to the flora.

Noord-Holland: Schoorl, 1 V 1954, *Barkman 4449*, on the ground and overgrowing mosses in heath of *Calluna* and *Empetrum* (L).

Limburg: south of Maastricht, immediate proximity of the Belgian village Canne, 21 V 1950, *Maas G. 7092*, overgrowing mosses on calcareous rock (det. Magnusson) (L).

BUELLIA De Not.

B. griseovirens (Turn. & Borr.) Almb. — Thallus grey or bluish grey, often bordered with a black prothalline fringe. Soralia maculiform, greenish, frequently confluent. All specimens examined are sterile.

New to the flora.

Groningen: Groningen, along road to Leeuwarden, 20 IX 1950, *Barkman 3457*, on *Ulmus* (det. Almborn) (L).

Friesland: Hardegarijp, 14 VIII 1951, *Barkman 3187* on *Quercus* (det. Almborn) (L); Wolvega, 6 VIII 1951, *Barkman 3198b* on *Quercus* (confirmed Almborn) (L).

Zuid-Holland: Voorne: Oostvoorne, 2 V 1953, *Maas G. 9347*, on *Populus* in the dunes (L).

Zeeland: Walcheren: Oostkapelle, "Westhove", 21 IV 1951, *Walrecht* on *Populus* in the dunes (L).

B. pharcidia (Ach.) Malme — Thallus grey, cortex K —, medulla J —. Apothecia up to 0.7 mm across, with black disc. Epithecium and hypothecium dark brown. Hymenium colourless, J + persistently blue. Spores at first colourless, turning blackish green or brown with maturity, fabiform (distinctly curved) or in inequilaterally ellipsoidal (not actually curved, but with one side plane and the other convex), permanently parallel 4-celled, or becoming somewhat muriform as a longitudinal wall develops in one or both of the central cells, 14.7—19.5 × 7.9—9.9 μ. Only once a spore was found with 4 transverse and 2 longitudinal septa. Paraphyses hardly conglutinate, septate, furcate upwards, with inflated apical cells.

Dr Magnusson whom I had sent our material under the name of *B. alboatra* drew my attention to a note by Malme (1927) on 2 *Buellia* species at that time little known in Sweden, one of them being *B. pharcidia*. This species used to be confused with *B. alboatra*, from which Malme showed it to differ in the generally somewhat larger apothecia, the stronger development of the parathecium, and more especially in the entirely different spores. Malme omitted to describe the spores of *B. alboatra*, but, fortunately, indicated Massalongo, Lich. Ital. exs. 289 as a good example of that species. Examination of our specimens of this exsiccatum reveals the spores to be of about the same size as in *B. pharcidia*, but ellipsoidal and straight instead. At first they are parallel 4-celled, but towards maturity the development of a longitudinal wall (sometimes even 2 septa) in 3 or all cells almost completely obscures the regularity of the original cells.

The size of the apothecia seems a character of minor importance, probably being somewhat dependent on individual development. The largest apothecia of *B. pharcidia* as measured first in a specimen collected by Malme (Gottland, Ljugarn, 1918) and given to me by Dr Magnusson for comparison, secondly in Magnusson, Lich. sel. scand. exs. 364, and subsequently in our material, range from 0.9 mm and 0.8 mm to 0.7 mm respectively, which comes close to 0.5 mm in *B. alboatra* of Massalongo no. 289.

As to the parathecium, I failed to find it any better developed in *pharcidia* than in *alboatra*.

New to the flora.

Noord-Holland: Texel: Den Burg, 2 IX 1951, *Barkman 3318*, on *Ulmus* (det. Magnusson) (L).

CANDELARIELLA Müll. Arg.

C. xanthostigma (Pers.) Lettau — This species, as understood by Swedish lichenologists, would differ from *C. vitellina* in the thallus consisting of "extremely small, usually 0.06—0.08 (0.1) mm, globular granules which as a rule are somewhat scattered, but may unite more or less into a crust" (translated from Magnusson, 1935. 123), whereas *vitellina* has "the granules c. 0.2 mm diam., forming a continuous crust" (Almborn, 1952. 244).

However, I think this too simplified an image of how matters appear to me, as our material shows intermediate stages which seem to obscure the differences between both species.

Barkman 3117b, identified by Almborn as *C. xanthostigma,* has a thallus made up of scattered granules which for the greater part are minute and globular, but a few are somewhat flattened and slightly lobate, measuring up to 384 × 266 μ.

In a collection from Walcheren all granules are globular and minute but so closely packed as to form a crust, only divided into areolae by numerous cracks. The thallus is even thicker than that of a specimen from Sweden (Skåne, Båstad, 1932, leg. Magnusson 13764a) of which the collector stated "thallus unusually thick!" Yet, the granules are decidedly unlike those of *C. vitellina,* not being flattish and incised-lobate.

Maas G. 3149b is different again in that towards the centre the originally minute, smooth, clear-cut and scattered granules turn into a dense mass of coalescent, verrucose knobs. The specimen looks equally different from both *xanthostigma* and *vitellina,* although Dr Magnusson, whom I had sent it, thought it might be the latter species.

The above may serve to show that it is probably better again to consider *xanthostigma* a variety of *vitellina,* but of course that will not lessen our trouble in distinguishing both taxa.

Not previously recorded.

Friesland: Vlieland: Oost Vlieland, 1 IV 1948, *Maas G. 9396,* on tree in village (L).

Noord-Holland: Oostwoud—Hauwert, 8 IV 1945, *Maas G. 3149b,* on *Ulmus* along road (L).

Zeeland: Walcheren, Middelburg—Nieuw en St. Joosland, 13 III 1942, *C. Brakman,* on *Populus* along road (L).

Noord-Brabant: Hintham, 3 VII 1904, *Wakker,* on *Populus,* c. apoth. (L); Lage Zwaluwe, 3 VII 1951, *Barkman 3117b,* on *Ulmus* (det. Almborn) (L).

CATILLARIA (Ach.) Th. Fr.

C. graniformis (Hag.) Vain. — It is no easy matter to distinguish the present species from the next in the pycnidial stage. In such cases Vainio's key (1934) is of no use, being based on apothecial characters, whereas Almborn in his key to the sterile, corticolous, crustaceous lichens (1952) leaves out *C. griffithii.* As may be gathered from Vainio's descriptions, the sterigmata (= fulcra sensu Steiner) should be simple in *graniformis,* sparingly branched in *griffithii,* whereas the pycnoconidia are said to be 2—3 × 1 μ in the former, 3—3.5 (or 4—5) × 1.5 μ in the latter. Examining our material of *graniformis,* identified by Almborn, I find the fulcra furcate at the base, and the pycnoconidia measuring 4.5—5 × 1.8 μ. Examination of what we possess of the exsiccata of *graniformis* quoted by Vainio (Arnold, Lich. Mon. exs. 179; Hepp, Flecht. Europ. 228, 497; Kryptog. exs. Vindob. 1231; Rabenhorst, Lich. Europ. exs. 94; Stenhammar, Lich. Suec. exs. 134) equally shows the fulcra to be furcate near the base, whereas the conidia are 3.6—4.5 × 1.3—1.8 μ. The length of the pycnoconidia in our exsiccata of *C. griffithii* (Arnold, Lich. exs. 216; Elenkin, Lich. Fl. Ross. 140; Hepp, Flecht. Europ. 738; Körber, Lich. sel. Germ. 278; Stenhammar, Lich. Suec. exs. 169) partly overlaps that of *graniformis*, measuring 4—6 μ.

Vainio describes the pycnidia (= conidangia) of *graniformis* as "conglomerata, in glomerulo partim partibus superioribus sejunctis ... partim laceratis" which in fact they seem to be in several of the exsiccata examined. In my opinion, however, these are no conglomerations, but single pycnidia which during their development have bulged in various directions, the process ending up by some of the bulges opening with a separate ostiolum. Young and simple pycnidia can also be found.

No description is given of the pycnidia of *griffithii*, as they were presumably unknown to Vainio. It appears that our exsiccata of *C. griffithii* usually have small, immersed, hard to find pycnidia, but larger ones (as in Arnold, Lich. exs. 216) with protruding upper parts and bulging lower parts do occur.

The above may have made it clear that I do not feel completely satisfied as to the correctness of the determination of both *C. graniformis* and *griffithii* when sterile.

New to the flora.

Noord-Holland: Naarden, Naardermeer, Kooi, 27 IV 1954, *Barkman 4404*, on *Salix*, c. apoth. (L).

Zuid-Holland: Krimpen aan de Lek, 16 VII 1951, *Barkman 3110*, on *Salix* (det. Almborn) (L).

Zeeland: Schouwen, Westenschouwen, 19 IX 1951, *Barkman 2841*, on *Fraxinus*, c. apoth., identity uncertain (det. Magnusson) (L).

C. griffithii (Sm.) Malme — See discussion under the preceding species.

New to the flora.

Friesland: Cornjum, 12 VIII 1951, *Barkman 3189*, c. apoth., on *Acer pseudoplatanus* (L); Tietjerk, 14 VIII 1951, *Barkman 3113b*, on *Fraxinus* (L); Vlieland: Oude Kooi, 31 III 1948, *Maas G. 3992*, on *Alnus* (L).

Overijsel: Dalfsen, 16 X 1951, *Barkman 4136*, on *Juglans* (det. Almborn) (L).

Utrecht: Leersum, 26 X 1940, *Maas G. 73a*, on *Salix* (L).

Noord-Holland: Bergen, Egmonderweg, 12 V 1954, *Maas G. 9668, 9670*, c. apoth., on *Quercus, Ulmus* (L); Bergen, Franschman, 12 V 1954, *Maas G. 9660*, c. apoth., on *Ulmus* (L); Bergen, Verbrande Pan, 12 V 1954, *Maas G. 9695*, c. apoth., on *Betula* (L); Hoorn, 8 IX 1951, *Barkman 3334b*, on *Ulmus* (L); Texel: De Kooy, 1 IX 1951, *Barkman 3342, 3415*, c. apoth. on *Salix* (L); Oude Schild, 30 VIII 1951, *Barkman 3344*, c. apoth., on *Fraxinus*; *3460*, on *Fraxinus* (det. Almborn) (L).

Zuid-Holland: De Zilk, 26 V 1947, *Maas G. 3707*, c. apoth., on *Ulmus* (L); Hazerswoude, 9 IV 1948, *Maas G. 4080*, on *Salix* (L); Voorne: Oostvoorne, 2 V 1953, *Maas G. 9350*, c. apoth., on *Populus* (L).

C. prasina (Fr.) Th. Fr. — Thallus fairly thick, greyish green to olive-green, granular-verrucose. Apothecia at first whitish or pallid flesh-colour, becoming darker with age, sometimes (sickly state?) blackish-livid. Epithecium greenish-brownish, K + pale reddish violet or pale purplish brown, this colour soon diffusing into the hymenium underneath. Hymenium colourless, 40—60 μ, J (very dilute solution) + blue, turning dingy red-brown. Hypothecium colourless or pallid, no gonidia underneath. Asci cylindrical-clavate, 8-spored, 35—50 × 10 μ. Spores colourless, 1—2-celled, 9—10.7 × 3.6—4.5 μ. Paraphyses flexuous, sparingly branched, reticulately anastomosing.

With regard to the positive reaction of the epithecium upon K, I may refer to the remark under *C. sordidescens.*

It seems worthwile to draw the attention to the striking resemblance of the sterile thalli of *C. prasina* and *Lecidea uliginosa.* Both may consist of minute, granular, sometimes isidia-like excrescences which may be simple, torulose or budding into various directions. I have to admit that I failed to find any clear-cut morphological differences. *L. uliginosa* has not been treated in Almborn's key (1952), but in this country it does occur on the weathered, much cracked bark at the base of old birches.

New to the flora.

Drente: Dwingelo, Lhee, Lheederzand, 18 VIII 1954, *Maas G. 10042,* c. apoth., among bryophytes and *Microphiale diluta* on *Quercus* in dense wood (L); *Maas G. 10098,* c. apoth., among bryophytes on fallen stick of *Picea* in wood (L).

Gelderland: Druten, Horssen, 19 VI 1951, *Barkman 3116,* sterile, on old *Populus* in wood (det. Almborn) (L).

Noord-Holland: Naarden, Naardermeer, Kooi, 27 IV 1954, *Barkman 4414,* c. apoth., on *Ulmus* in moist wood (L).

C. prasina (Fr.) Th. Fr. f. **laeta** Th. Fr. — Differing from f. *prasina* described above in that the apothecia remain pale, being pale livid grey or greenish pallid or darkish leaden blue-grey with or without pallid margin. Epithecium olivaceous, K — or in places + faintly reddish violet. Hymenium colourless, 55—60 μ, J (very dilute solution) + blue, turning (sometimes dingy) red-brown. Hypothecium colourless. Spores colourless, ellipsoidal, 1—2-celled, (9)12—13(15) × 3.5—4.5 μ.

Dr Magnusson wrote as follows about the material: "... after Th. Fr., Lich. Scand., it is C. prasina f. laeta, but there is a too rich development of algae ... Determined after Vainio where the group is divided into several, badly delimited species it does not agree with his prasina that ought to be KOH —, but it agrees still less with his sordidescens. I know this bluish pale form in a normal state from the excursions here about, but do not remember that I have found such a form with a surplus of algae." However, see remarks under *C. sordidescens.*

New to the flora.

Gelderland: Dieren, Hagenau, 20 IV 1951, *Maas G. 7689,* among mosses, *Trentepohlia aurea* and *Microphiale diluta* f. *leucostigma* on *Fagus* in wood (det. Magnusson) (L).

C. sordidescens (Nyl.) Vain. — Thallus fairly thick, grey-green to glaucous green, granular-verruculose. Apothecia livid brown-black, convex. Epithecium greenish brown, K + purplish brown to fuscous-violaceous. Hymenium colourless, 55—65 μ, J (very dilute solution) + dark violet-blue. Hypothecium pallid, yellowish, with no gonidia underneath. Asci cylindrical-clavate, 8-spored, 43—61 × 14 μ. Spores colourless, ellipsoidal-ovoid, 2-celled, 10—11.8 × 3.9 μ. Paraphyses sparse, extremely thin, flexuous, sparingly branched, anastomosing.

The present collection is in perfect agreement with Arnold, Lich exs. 280c and Hepp, Flecht. Europ. 278, both of which are cited by Vainio (1934. 464).

Macroscopically the thallus resembles that of our specimens of *C. pra-*

sina f. *laeta*, but the apothecia are differently coloured. Microscopically the apothecia differ from that form in that the epithecium reacts more strongly to K, whereas the hymenium instead of turning red-brown after a while remains dark ink-blue.

In connection with the hesitance expressed by Magnusson concerning *C. prasina* f. *laeta*, it is interesting to read Vainio's Observatio 1 (1934. 467) in which it is stated that once in a while *C. prasina* may have somewhat darker apothecia of which the epithecium does stain violaceous with K.

Possibly, the iodine reaction of the hymenium provides a more reliable method by which to distinguish *sordidescens* from dark forms of *prasina*. The material we possess of *C. prasina* f. *laeta* (Lich. Suec., Västerg., Floby, Hasslebergen, Sept. 1915, leg. Vrang) certainly strengthens this assumption.

New to the flora.

Noord-Brabant: 's Hertogenbosch, Helvoirtse weg, 17 III 1906, *Wakker*, on *Quercus* (L).

CHAENOTHECA Th. Fr.

Ch. chrysocephala (Ach.) Th. Fr. f. **melanocephala** (Nyl.) A. L. Sm. — Thallus yellowish green, granular, partly servediose. Apothecia with entirely black stipe and capitulum.

Abeleven (1898. 51) recorded the species as *Cyphelium chrysocephalum* Turn. from a single locality, near Groningen, where it had been collected both by Van Hall and Miquel. The lack of the yellow-green pruina in the upper part of the fruit stalk and on the excipulum shows the specimens to belong to f. *melanocephala*.

Groningen: Groningen, no date, *Van Hall, Miquel* (NBV).

Zuid-Holland: Warmond, Huis te Warmond, 27 V 1953, *Barkman 4147*, on old *Aesculus* near pond in wood (L).

Ch. melanophaea (Ach.) Zw. — Thallus grey or greenish grey, often suffused with yellow, verrucose-granular. Fruit stalk black. Disc originally fuscous. Macaedium often lighter brown.

Not previously recorded.

Friesland: Gaasterland, Rijs, Rijster bos, 19 VIII 1951, *Barkman 3443*, on *Quercus* (L); St. Nicolaasga, Huis ter Heide, 10 VIII 1951, *Barkman 3444*, on *Pinus* (L).

Drente: Diever, Berkenheuvel, 25 XII 1953, *Beyerinck*, on *Pinus* (Beyerinck); Oosterhesselen, De Klenke, 14 X 1951, *Barkman 3448*, on *Quercus* (L); Westerbork, 14 X 1951, *Barkman 3451*, on *Pinus*, edge of wood (L).

Overijsel: Denekamp, De Borge, 17 X 1951, *Barkman 3447*, on *Quercus*, edge of wood (L); Zwolle-Wijhe, Windesheim, 11 X 1951, *Barkman 3452* on *Quercus*, edge of wood (L).

Gelderland: Beekhuizen, 19 IV 1951, *Maas G. 7668*, on old *Fagus*, edge of wood (L); Ede, Edese bos, 10 VIII 1953, *Maas G. 9444*, on *Quercus* in wood (L); Hoog Keppel, 24 VII 1951, *Barkman 3455*, on *Quercus* (L); Leuvenum, Leuvenumse bos, 27 IV 1951, *Barkman 3456*, on *Quercus* in wood (L); Wolfheze, Wodanseiken, 18 IV 1951, *Maas G. 7655*, on very old *Quercus* in wood, *7656*, on *Pinus* in wood (L).

Utrecht: Leersum, 27 X 1940, *Maas G. 91a, 97* on *Pinus*, edge of wood (L); Rhenen, Achterberg, 3 VIII 1862, *Sprée*, on *Quercus* (NBV).

Noord-Holland: Naarden, Naardermeer, Kooi, 27 IV 1954, *Barkman 4416*, on *Quercus* (L).

Zuid-Holland: 's Gravenhage, Haagse bos, IV 1850, *Van der Sande Lacoste* (NBV).

Noord-Brabant: Nederhemert, 5 VII 1951, *Barkman 3453*, on *Juglans* at edge of marsh (L).

CLADONIA (Hill.) Vain.

Cl. caespiticia (Pers.) Flk. — New to the flora.

Noord-Brabant: Helvoirt, 15 III 1903, *Wakker* (L).

Cl. cornuta (L.) Schaer. — Abeleven (1891.5) reported the species from Marum (Groningen), collected in 1829 on a thatched roof by Van Hall, but on re-examination the specimens appear to belong to *Cladonia coniocraea.*

In the herbarium there are a few old collections under the name of *Cl. cornuta*, but these are referable to various other species.

New to the flora.

Drente: Diever, Berkenheuvel, 11 XII 1953, *Beijerinck* (Beijerinck, L); Dwingelo, 31 VII 1941, *Maas G. 1404a,* among low *Calluna* (L); Zuidwolde, 11 VIII 1920, *Ten Kate* (L).

Cl. cornuta (L.) Schaer. f. **phyllotoca** (Flk.) Vain. — New to the flora.

Groningen: Haren, Witte Veen, no date, *Acker Stratingh* (Gro).

Zeeland: Zuid-Beveland: vicinity of Kloetinge, 5 VI 1951, *Walrecht,* border of ditch (L).

Cl. nemoxyna (Ach.) Coem. — Podetia Pd + yellowish.

Contrary to Sandstede (1938. 78—79) who assumed a slight content of fumarprotocetraric acid which would account for the positive Pd-reaction, Dahl (1950. 110) maintains that *nemoxyna* is devoid of this acid, but has 2 others instead.

New to the flora.

Gelderland: Putten-Garderen, 2 III 1950, *Maas G. 6838,* in heath, among poor *Calluna* and *Cl. cornutoradiata* (L).

Cl. pyxidata (L.) Fr. var. **grayi** Merrill — Podetia scyphiferous, sparingly granular-servidiose, decorticate on the outside of the cups, coarsely granular on the inside. Cups with many marginal proliferations which are tipped with crowded apothecia. Pd —.

On account of the strong podetial squamules, the specimens are referable to what Sandstede called f. *squamulosa.*

I have not seen the original description, but as may be inferred from Dahl (1950. 105), *grayi* was described as a variety and subsequently raised to specific rank by Sandstede.

As pointed out by Asahina (1940. 717) and Evans (1944. 597; 1952. 300) *grayi* may or may not have fumarprotocetraric acid which accounts for a positive or negative Pd-reaction. In view of the former possibility it is probable, therefore, that more specimens of *grayi* will eventually be found in our collections of *Cl. pyxidata* var. *chlorophaea*, since the only difference between *chlorophaea* and *grayi* thusfar seems to lie in the content of grayani(ni)c acid of the latter. Our *chlorophaea* has not been tested microchemically.

Although various authors assert *grayi* to differ from *chlorophaea* in chemical respect only, I found the way the soredia are borne on the podetia somewhat unusual for *chlorophaea,* but that may have been an exceptional case.

New to the flora.

Drente: Terhorst, 11 VIII 1953, *Damman* (Damman, L).

Cl. rangiferina (L.) Web. — Various records under this name have been published in the past which are supported by well over one hundred collections in the Rijksherbarium and in the herbarium of the Botanical Society. None of these, however, is the true *rangiferina*. As yet, I know the species from one locality only, and I have reason to regard *Cl. rangiferina* as extremely rare.

New to the flora.

Gelderland: Hierden, Hulshorst, 26 XI 1947, *Maas G. 3883*; 25 II 1951, *Maas G. 7626*, among other *Cladinae* and bryophytes in cultivated wood of *Pinus sylvestris* (L).

Cl. scabriuscula (Del.) Sandst. — Not previously recorded.

Friesland: Terschelling: Koegelwieck, VIII 1940, *Westhoff*, in Corynephoretum (U); Vlieland: Kroonpolders, 31 III 1948, *Maas G. 3997, 3998*, among bryophytes on sand (L).

Drente: Lheebroek, Lheebroekerzand, 4 X 1944, *Wasscher*, among *Erica* in heath (L).

Zuid-Holland: Berkenwoude, Wellepoort-polder, 18 VI 1947, *Maas G. 3724*, among *Molinia caerulea* in peatmoor (L).

Zeeland: Walcheren: Oostkapelle, Westhove, 30 VI 1951, *Walrecht*, among *Polytrichum* (L); Oostkapelle-Vrouwenpolder, 25 V 1946, *C. Brakman*, edge of ditch (L); Vrouwenpolder, Overduin, 21 XII 1943, 21 I 1944, *C. Brakman*, among mosses (L); Zuid-Beveland: vicinity of Kloetinge, 5 VI 1951, *Walrecht*, edge of ditch (L).

Cl. strepsilis (Ach.) Vain. — Primary thallus, especially the white underside, Pd + tardily and permanently chrome-yellow. Apothecia uncommon.

Not previously recorded.

Drente: Dwingelo, Davidsplas, 26 VI 1941, *Meeuse*, among *Erica tetralix* (L); Zuidwolde, XII 1920, *Ten Kate* (det. Sandstede, Ten Kate) (L); Zuidwolde, Oosterveld, 23 IV 1919, *Ten Kate* (det. Ten Kate) (L).

Overijsel: Lattrop, Lattropse Veld, 10 VI 1948, *Maas G. 4166*, among low *Calluna vulgaris* (L); Weerselo, Everlo, 7 VIII 1951, *Van Ooststroom 15511*, among *Drosera* and *Sphagnum*, c. apoth. (L).

Gelderland: Kootwijk, IV 1948, *Schimmel & Van Leeuwen* (L); Putten-Garderen, Sprielder bos, 2 II 1950, *Maas G. 6844*, among scattered pines, *Calluna*, *Aira flexuosa*, *Cl. papillaria*, c. apoth. (L); Stroe, Stroese Zand, 12 III 1948, *Schimmel & Van Leeuwen*, in Corynephoretum cladonietosum (L).

Utrecht: Bilthoven, 2 IV 1919, *Ten Kate* (det. Sandstede) (L).

Noord-Brabant: Oisterwijk, Kampina, 24 VII 1943, *Maas G. 2633a*, among *Erica*, *Drosera*, *Narthecium*, few *Calluna* (L).

Cl. zopfii Vain. — This species has not previously been recorded, although it was collected also in earlier days, but it has almost invariably been mistaken for *Cl. uncialis*.

Drente: vicinity of Langelo, 6 II 1944, *Hoogland* (L); Zuidwolde, 15 VIII 1922, *Ten Kate* (L); Zuidwolde, Oosterveld, 24 VII 1919, *Ten Kate* (L).

Overijsel: Lattrop, Lattropse Veld, 10 VI 1948, *Maas G. 4154* in peat-moor, among *Erica*, *Myrica*, *Leucobryum* (L); Lemele, Lemeler berg, 27 VII 1941, *Maas G. 1320* among low *Calluna* (L); Vaasse-Ootmarsum, Paardenslenk, 28 IV 1946, *Stafleu* (U).

Gelderland: Hatert, 19th century, *Abeleven* (NBV); Hierden, Hulshorst, 23 VII 1934, *Kruyt* (L); Kootwijk, 7 IV 1948, *Schimmel & Van Leeuwen*, among *Corynephorus* (L); Nijkerk, 19th century, *Bondam* (NBV); Nijmegen, Berg en Dal, XI 1873, *Van Hall* (NBV).

Utrecht: Den Dolder, 2 IX 1931, *Van Ooststroom 4630, 4631* (L); Maarn, Henschoter meer, 6 X 1948, *Westhoff*, on bare sand (L).

Noord-Brabant: Oisterwijk, Heikant, 24 VII 1943, *Maas G. 2655*, dry *Calluna* heath (L); Oisterwijk, Kampina, 24 VII 1943, *Maas G. 2629a*, low moist *Erica* heath (L).

EVERNIA Ach.

E. prunastri (L.) Ach. var. **herinii** (Duv.) Maas G. **comb. nov.** — *Evernia herinii* Duv. Bull. Soc. Roy. Bot. Belg. ser. 2, **22**: 153. 1940 — In morphological respect Duvigneaud's "species" is essentially identical with *E. prunastri*. The difference is purely chemical, as *herinii* lacks usninic acid and is stated to possess an unknown substance which would account for the grey colour of the upper side of the thallus (Duvigneaud, l. c.).

As to the taxonomic rank to be assigned to *herinii*, the following should be remembered. A lichen consists of an algal and a fungal component, and the latter should play the dominant role where taxonomical classification is concerned. As long as there is no proof of the fungus in *herinii* being specifically different from that in *prunastri*, it seems best to treat the former as a variety whose physiology is different from that of the latter. New to the flora.

Zuid-Holland: Beijerland; Numansdorp-Strijen, near Schuring, 21 VII 1951, *Barkman 3081*, among *Ramalinae* and *Evernia prunastri* on *Ulmus* along road (L).

Zeeland: Schouwen: Haamstede, 7 VI 1952, *Walrecht*, on *Acer* sp. (L); Zeeuws Vlaanderen: St. Janssteen, 25 VIII 1951, 30 X 1951, *Walrecht*, on *Quercus* (L); Zuid-Beveland: Wolphaartsdijk-Wilhelminadorp, 15 III 1952, *Walrecht*, on *Ulmus* (L).

Noord-Brabant: Ulvenhout, Valkenberg, 11 IV 1952, *Walrecht*, on *Quercus* (L).

GYALECTA (Ach.) A. Zahlbr.

G. truncigena (Ach.) Hepp — Thallus hardly perceptible. Apothecia numerous, immersed to sessile, with thick, pallid margin and pale incarnate disc. Asci cylindrical, 6—8-spored, with thin, hardly visible (± 1.5 μ, gelatinising?) wall, J + blue, turning pale violet or vinaceous, 73—100 × 12—16 μ. Spores (transversely to) obliquely 1—2-seriate, colourless, ellipsoidal to sublimoniform or subfusiform, sometimes one end tapering into a short or fairly long tail, straight or somewhat curved, tardily becoming muriform through the formation of 4—7 transverse walls and 1—4 longitudinal walls, the latter frequently oblique, 16.7—25.6 × 7.9—9.9 μ. Paraphyses free, imbedded in copious "gelatina hymenialis", thick, straight, septate, usually simple, sometimes furcate above, colourless, but towards the base inspersed with orange-yellow droplets, with hardly incrassate or capitate-clavate tip.

The species varies a great deal, also in the sporal characters. In the specimen collected near Utrecht, 1837, the spores are predominantly parallel-celled with (4—)5—7 transverse septa, those with a longitudinal wall in one of the cells being very scarce. This makes the specimen resemble *G. croatica*, but it differs from that species in the somewhat longer paraphyses (85—100 μ, whereas they are 65—90 μ in *croatica*), the tail-like appendage in a number of the spores, and the occasional occurrence of a longitudinal septum. In connection with these characters I may refer to Lettau (1937. 195).

Abeleven (1898. 36) listed *Secoliga abstrusa*, which is a synonym of *Gyalecta truncigena*, from Schierstins near Veenwouden in the province of Friesland, collected on apple-trees by Sprée, 1 XII 1869. This appears to be an error, the specimens being referable to *Bacidia luteola*.

Utrecht: vicinity of Utrecht, IX 1837, *Wttewaal*, together with *Bacidia luteola* and *Arthopyrenia gemmata*, (inserted under the latter, remaining unobserved) in fissures of bark of *Ulmus* (NBV).

Zeeland: Schouwen: vicinity of Schuddebeurs, 21 IX 1951, *Barkman 4198*, in fissures of bark of *Ulmus* (L); Voorne: Oostvoorne, Middelburg, 2 V 1953, *Barkman 4148*, in fissures of bark of *Ulmus* (L).

HAEMATOMMA Mass.

H. coccineum (Dicks.) Körb. — New to the flora.

Zeeland: Zuid-Beveland: Kloetinge, 12 XI 1943, *Maas G. 2941*, on *Fraxinus*, edge of orchard (det. Almborn) (L).

H. coccineum (Dicks.) Körb. var. **porphyrium** (Pers.) Th. Fr. — New to the flora.

Groningen: Warffum, Breedenburg, 24 IX 1950, *Barkman 3459*, on *Ulmus*, sheltered (det. Almborn) (L).

LECANIA Mass.

L. cyrtella (Ach.) Th. Fr. — Thallus greyish green, verruculose to granular. Apothecia numerous to crowded, plane, then convex, with the disc incarnate to fuscous, thalline margin finally disappearing. Epithecium almost colourless to brown. Hymenium colourless, J + persistently blue, or turning vinaceous to dark violet (40) 60—70 μ. Hypothecium colourless to yellowish, J + persistently blue, with gonidia underneath. Asci cylindrical-clavate, with thickened apical wall, 8-spored, 40—50 × 10—14 μ. Spores colourless, 2-celled, ellipsoidal to subfusiform, straight, (8.9) 10—13.8 (15.8) × 3—5 (5.7) μ. Paraphyses colourless, conglutinate, septate, brown and densely branched upwards, with the cells constricted at the septa.

I failed to observe any 16-spored asci. On account of the straight spores I regard the collections mentioned below as referable to the present species.

The only record thusfar of the species, as *Biatorina cyrtella*, dates as far back as 1855 (Abeleven, 1898).

Noord-Holland: Texel: De Cocksdorp, 2 IX 1951, *Barkman 3436*, on *Ulmus* (L); De Muy, 10 V 1942, *Stafleu*, on *Sambucus nigra* (U).

Zuid-Holland: Voorne: Oostvoorne, vicinity Groene Strand, 2 V 1953, *Maas G. 9366*, on *Populus* (L).

Zeeland: Zuid-Beveland: near Goes, 1855, *Van den Bosch*, on *Ulmus* (NBV).

Noord-Brabant: Lage Zwaluwe, 3 VII 1951, *Barkman 3379a*, on *Salix* in willow coppice (L).

L. dimera (Nyl.) Th. Fr. — Differs from the previous species in having fabiform spores.

New to the flora.

Zuid-Holland: Overflakkee: Melissant, 16 IV 1952, *Barkman 2888*, base of *Ulmus* (L).

Noord-Brabant: 's Hertogenbosch, fort, 28 I 1905, *Wakker*, on *Alnus* (L); 's-Hertogenbosch-Vlijmen, 5 XI 1904, *Wakker*, on *Salix*, identity uncertain (L); Rosmalen, Steenenkamer, 12 XI 1904, *Wakker*, on *Populus* (L).

LECIDEA (Ach.) A. Zahlbr.

L. olivacea (Hoffm.) Mass. var. **soralifera** Erichs. — Not previously recorded.

Zuid-Holland: Oud Ade, 21 VIII 1943, *Maas G. 2749b*, on *Ulmus* along road (det. Magnusson) (L).

MICROPHIALE (Stizenb.) A. Zahlbr.

M. diluta (Pers.) A. Zahlbr. — Thallus greenish grey, somewhat verruculose. Apothecia 0.1—0.2 mm across, entirely pale incarnate to pallid, with thick entire margin. Disc concolorous, turning brownish grey with age. Asci cylindrical, 8-spored, 60—70 × 6 μ, J + (pale blue, quickly turning) pale vinaceous, finally pinkish orange to orange-brown. Spores obliquely 1-seriate, colourless, fusiform, 2-celled, straight, 8.9—14.8 × 3.9—4.5 μ. Paraphyses colourless, free or somewhat coherent at the apex, filiform, simple, septate, with spathulate or somewhat clavate, sometimes torulose apex, 98—108 × 1.5—4 μ.

I usually failed to observe that, as stated by Lettau, the asci should first stain blue with iodine.

New to the flora.

Friesland: Tietjerk, 14 VIII 1951, *Barkman 3424*, on *Fraxinus* in decoy (L).

Drente: Dwingelo, Lhee, Lheederzand, 18 VIII 1954, *Maas G. 10043*, among bryophytes and *Catillaria prasina* on *Quercus* (L).

Noord-Holland: Bergen-Egmond, 12 V 1954, *Maas G. 9666*, on *Quercus* (L).

M. diluta (Pers.) A. Zahlbr. f. **leucostigma** (Leight.) A. Zahlbr. — Differing from f. *diluta* described above in having whitish apothecia.

Magnusson in a letter suggested that this form would represent a sickly state, adding that he had never seen it before. Lettau (1937. 212) in his treatise of the *Gyalectaceae* is rather evasive as to the nature of this form.

New to the flora.

Gelderland: Dieren, Hagenau, 20 IV 1951, *Maas G. 7690*, among bryophytes, *Trentepohlia aurea*, *Catillaria prasina* f. *laeta* on *Fagus* in wood (det. Magnusson) (L).

Noord-Holland: Bergen, Verbrande Pan, 12 V 1954, *Maas G. 9696*, on *Betula* in the dunes (L); Naarden, Naardermeer, Diemonts bos, 27 IV 1954, *Barkman 4406*, on *Alnus* in moist wood (L).

OCHROLECHIA Mass.

O. subviridis (Höeg) Erichs. — Thallus greyish, nearly smooth to verruculose, not rimose, either isidiate, isidia turning into soredia, or sorediate, margin white, not zonate. Cortex and medulla KC + orange-red.

Not previously recorded.

Gelderland: Elspeet, 24 IV 1951, *Barkman 3205*, on *Fagus* (confirmed Almborn) (L); Hoog Keppel, 24 VII 1951, *Barkman 3175* (det. Almborn) (L).

OPEGRAPHA Humb.

Although in this country the number of species of the present genus is limited, *Opegrapha* is an important component in epiphytic associations. When working up the material, it was found desirable also to revise the older collections which with few exceptions proved incorrectly identified. *O. atra* appeared correctly named in a number of cases, and is not being treated here for that reason. All species mentioned are corticolous and belong to the section *Euopegrapha* Müll. Arg. with the excipulum closed at the base.

O. betulina Sm. — Disc narrow at first, becoming dilated in the centre with age. Asci cylindrical-clavate, (45)51—55(70) × (12)14—18

(20) μ. Spores vestigiiform (footprint-shaped), 4-celled, (15.8)17.7—23.6 × (3.9)4.9—7.9 μ.

Not previously recorded.

Friesland: Jelsum, 12 VIII 1951, *Barkman 3425*, on *Ulmus* (L); Veenklooster, 14 VIII 1951, *Barkman 3427a*, on *Fagus* (L); Veenwouden—Zwaag-Westeinde, 12 II 1869, *Sprée*, on *Salix* (NBV).

Groningen: Groningen, IV 1853, *Van Hall* (?) (Gro); Haren, IV 1831, *Van Hall*, on *Salix* (NBV); Zuidhorn, Arnichem, 19 III 1908, *Van Giffen*, on *Acer pseudoplat.* (Gro.).

Overijsel: Kampen, no date, Bondam (L, NBV); no date, Bondam, on *Quercus* ((NBV); no date, *Top* (L); Kampen, Zandberg, no date, *Top* (L); IJsselmuiden, no date, *Bondam*, on *Salix* (L).

Utrecht: Nigtevecht, 6 V 1934, *Nannenga 533*, on *Salix* (U); Polanen, Wulverhorst, 2 V 1952, *Barkman 2951*, on *Ulmus* (L); Utrecht, no date, *Van der Sande Lacoste* (NBV); no date, *Van der Sande Lacoste*, on *Salix* (NBV); 1841, *Van der Sande Lacoste*, on *Quercus* (L); 1841, *Van der Sande Lacoste*, on *Tilia* (NBV); Vreeland, IV 1873, *Oudemans*, on *Salix* (Gro); Zuilen, 1841, *Van der Sande Lacoste*, on *Fraxinus* (NBV); Zuilen-Maarssen, IV 1870, *Beinz*, on *Populus* (L).

Noord-Holland: Amsterdam, Kalfjeslaan, XII 1848, *Van der Sande Lacoste*, on *Salix* (NBV); Bergen-Egmond, 't Woud, 22 IX 1943, *Barkman 643*, on *Ulmus* (L); Hoorn, 8 IX 1951, *Barkman 3381b*, on *Ulmus* (L); Naardermeer, Eendekooi, 16 III 1952, *Reijnders*, on *Salix* (L).

Zuid-Holland: Krimpen a. d. Lek, 16 VII 1951, *Barkman 3397*, on *Salix* (L); Lisse, Keukenhof, 30 V 1924, *Ten Kate*, on *Ulmus* (L); Vianen-Lexmond, 20 IV 1952, *Barkman 2917*, on *Salix* (L); Voorne: Oostvoorne, Mildenburg, 2 V 1953, *Barkman 4152*, on *Ulmus* (L); Rockanje, Windgat, 3 V 1953, *Maas G. 9384*, on *Salix* (L).

Zeeland: Schouwen: Schuddebeurs, 21 IX 1951, *Barkman 3429a*, on *Ulmus* (L); Zuid-Beveland: locality not specified, no date, *Van den Bosch*, on *Populus* (NBV); 1844, *Van den Bosch*, on *Salix* (L); Zwake, 1841, *Van den Bosch* (L).

O. cinerea Chev. — Disc usually slit-like, but not infrequently also widening, sometimes broad and plane. Asci cylindrical-clavate, (40)50—60(70) × 10—14 μ. Spores elongate-fusiform, 5—7-celled, straight or somewhat curved, (19.6)23.6—27.6(32) × 3—4 μ. Pycnoconidia falcate, tapering towards the ends (9.8)11.8—15.8(18.7) × 1—1.5 μ.

Redinger (1938. 360) describes the thallus as "dünnhäutig ... geglättet bis glatt" which is rarely the case in our material. Thin, smooth thalli do occur, but they become thicker and areolate as they grow, and to me it seems that the more exposed the habitat, the sooner it applies. In Redinger's description the disc is said to be permanently narrow and slit-like, but as stated above, widened or even broad and plane discs are by no means exceptional in this country.

A most unusual collection which with some hesitation is referred to the present species is *Barkman 3411*, from Nes, island of Ameland. The main features are as follows. Thallus grey, thick, areolate. Lirellae elongate, with acute ends, usually curved, often furcate. Disc black, broad, plane. Excipulum incompletely closed at the base, although by no means lacking as in subgen. *Pleurothecium*. Asci up to 78 μ long. Spores 6—7-celled, but in the same ascus also 8—9-celled, (23.6)25.6—29.6(35.5) × 3.9 μ. Pycnoconidia falcate, 11.8—16.7(19.7) × ± 1 μ, little or not tapering towards the ends. Some of the characters seem to agree with those of *Opegrapha danica* as described by Erichsen (1942. 140), but our specimens differ from that species in the mainly epiphloeodal thallus, the apothecia being frequently furcate, the hymenium colouring red-brown with J, and the somewhat broader, sometimes more-celled spores which have the ends not acuminate.

For the rest, a closer investigation of the *cinerea-danica*-group may very well reveal that the latter lies within the limits of variability of the former. A collection like *Barkman 3376,* from Speulde, which has the thallus mainly hypophloeodal and the spores longer than in typical *cinerea,* but the pycnoconidia tapering towards the ends as in that species, suggests such an infra-specific relationship.

The present species was enumerated by Abeleven (1898. 47) under the synonym of *Opegrapha atra β vulgata* Kbr., but some collections are mixtures of various other species.

Friesland: Ameland: Nes, 7 IX 1951, *Barkman 3411,* on *Ulmus,* deviating collection (L); Paesens, 15 VIII 1951, *Barkman 3428,* on *Ulmus* (L); Sneek, 17 VIII 1951, *Barkman 3410,* on *Ulmus* (L); Tietjerk, 14 VIII 1951, *Barkman 3423,* on *Tilia* (L); Veenwouden—Zwaag-Westeinde, 12 XII 1869, *Sprée,* on *Salix* (NBV).

Groningen: Groningen, no date, *Van Hall,* on *Crataegus* (NBV); Uitwierda near Delfzijl, 25 IX 1950, *Barkman 3421,* on *Tilia* (L); Warffum, 23 IX 1950, *Barkman 3418,* on *Pirus malus* (L).

Overijsel: near Kampen, V 1889, *Top* (L); IJselmuiden, no date, *Bondam,* on *Salix,* identity uncertain, pycnides only (L).

Gelderland: Beekhuizen, no date, *Van den Bosch,* identity uncertain, pycnides only (NBV); Beesd, 7 VII 1951, *Barkman 3387,* on *Ulmus* (L); Drie, 29 IV 1951, *Barkman 3377,* on *Fagus* (L); Garderen, 29 IV 1951, *Barkman 3419,* on *Fagus* (L); Randwijk, 19 IV 1951, *Maas G. 7660,* on *Salix* (L); Speulde, Speulder bos, 30 IV 1951, *Barkman 3376,* on *Fagus,* approaching *O. danica* Erichs. (L).

Utrecht: Vreeland, II 1873, *Oudemans,* on *Salix* (Gro).

Noord-Holland: Amsterdam, Zaagpad, I 1849, *Van der Sande Lacoste,* on *Tilia* (L); Amsterdam-Amstelveen, III 1849, *Van der Sande Lacoste,* on *Ulmus* and *Salix* (L); Bergen, 20 IX 1943, *Barkman 622,* on *Ulmus* (L); Bergen, Breelaan, 30 IV 1954, *Reijnders,* on *Ulmus* (Reijnders); Bergen-Egmond, Wimmenum, 12 V 1954, *Maas G. 9688,* on *Ulmus* (L).

Zuid-Holland: De Zilk, 26 V 1947, *Maas G. 3712, 8492,* on *Ulmus* (L); Goeree, dunal area, 15 IV 1952, *Barkman 2897a,* on *Ulmus* (L); Vianen-Lexmond, 20 IV 1952, *Barkman 2917,* on *Salix* (L); Voorne: Oostvoorne, 20 VII 1951, *Barkman 3432b,* on *Quercus* (L); Oostvoorne, Mildenburg, 2 V 1953, *Barkman 4152, Maas G. 9374,* on *Ulmus* (L).

Zeeland: Zuid-Beveland: Goes, no date, *Van den Bosch,* on *Pirus malus* (NBV); Goes, 12 XI 1943, *Maas G. 2949,* on *Ulmus* (L); Kloetinge, 1843, *Van den Bosch* (NBV).

Noord-Brabant: Best-Liempde, 11 X 1908, *Wakker,* on *Carpinus* (L); Engelen, Engelse Veer, 14 IV 1908, *Wakker,* on *Salix* (L); Helvoirt, 16 XI 1904, *Wakker,* on *Salix* (L); 's-Hertogenbosch, 13 V 1903, *Wakker,* on *Quercus* (L); St. Michielsgestel, Horzikse dijk, 11 VIII 1903, *Wakker,* on *Juglans* (L); Nuland, Wolfsdijk, 25 II 1906, *Wakker,* on *Fagus* (L); Vucht, 31 III, 7 XI 1904, *Wakker,* on *Salix* (L).

O. devulgata Nyl. — Disc slit-like. Asci cylindrical-clavate, 50—75 × 12 μ. Spores elongate-fusiform, 6—7-celled, straight or somewhat curved, 22.7—27.6 × 3—4 μ. Pycnoconidia falcate, 9.8—12.8 × 0.9—1(1.5) μ.

Not previously recorded.

Overijsel: Zwolle, V 1889, *Top* (L).

Zuid-Holland: Wassenaar, 6 III 1923, *Ten Kate,* on *Populus* (L).

Zeeland: Walcheren: Oostkapelle, 24 IX 1951, *Barkman 3402,* on *Ulmus* (L).

O. diaphora (Ach.) Ach. — Disc slit-like to somewhat widened. Asci cylindrical-clavate, 45—55 × 14—16 μ. Spores turning brownish with age, vestigiiform, 6-celled, (17.7)18—25.6 × (4.9)6—8.9 μ. Pycnoconidia ellipsoidal, straight or somewhat curved, 4—5 × 1.5—2(2.5) μ.

Under the synonym of *Opegrapha varia* var. *diaphora* Abeleven (1898.

46) recorded some localities, but none of the specimens proved correctly determined.

Gelderland: Beekhuizen, 19 IV 1951, *Maas G. 7669, 7674,* on *Fagus* (L); Elspeet, Elspeter bos, 23 IV 1951, *Barkman 3433,* on *Fagus* (L); Speulde, Speulder bos, 30 IV 1951, *Barkman 3391,* on *Fagus* (L).

Utrecht: De Bilt, 1841, *Van der Sande Lacoste,* on *Fagus* (NBV); Zeist, 1841, *Van der Sande Lacoste,* on *Fagus* (NBV).

O. dubia Leight. — Thallus yellowish grey or grey with ochraceous patches. Disc slit-like, later on widening. Asci cylindrical-clavate, 50—70 (80) × 12—14 μ. Spores elongate-fusiform to acicular, 6—9(—12)-celled, straight or somewhat curved, (21.7)22.4—31.5(35.5) × 3—4 μ. Pycnoconidia cylindrical, somewhat curved to falcate, (3.6)4.5—5.8(6.9) × 0.9—1 μ.

Since our two recent collections differ from Redinger's description (1938. 387) regarding some important points, I asked for and was granted the loan of Leighton's material from Kew Herbarium. Of the specimens glued on the sheets I examined the type collection (July 4th 1866 on a Scotch fir by the side of the Bala turnpike road about three quarters of a mile from Dolgelley, North Wales) and Leighton, Lich. Brit. Exs. 312 which is on the bark of a deciduous tree, probably *Populus.* It appears that Redinger's description needs the following corrections and emendations: Thallus not always made up of "kleine ... Fleckchen", frequently covering larger patches of several square centimeters, thin and smooth or somewhat thicker and minutely cracked, especially in the centre. Apothecia usually simple, sometimes furcate. Excipulum decidedly not "am Grunde ... keilförmig verschmälert", but with broad and plane base. Epithecium not only "hellbräunlich", also reddish brown to fuscous, either smooth or crumbly. Spores frequently "(7—)8-zellig", but 9-celled ones do occur, whereas Leighton described them as 6—9-septate.

It is true that our material (*Barkman 598, 3412*) is not fully identical with Leighton's specimens, the main discrepancy being in the spores which may be up to 12-celled, but in view of the wide range of cells found to occur in the spores of other species (e. g. *O. viridis*), it seems reasonable to allow the present species some variability in this respect. As to the length of the spores, which in our specimens considerably exceeds that of the type material (Leichton: 0.29 mm; I found: 24.6—29.6 μ), I may refer to Redinger's measurements.

Not previously recorded.

Friesland: Boekhorst (there is more than one locality of this name; unknown which is meant), 2 XII 1860, *Sprée,* on bark of deciduous tree (NBV); Terschelling: Midsland, 4 IX 1951, *Barkman 3412,* on *Ulmus* (L).

Noord-Holland: Callantsoog, De Stolpen, 29 IX 1943, *Barkman 598,* on *Ulmus* (L).

O. fuscella (Fr.) Almb. (*O. hapaleoides* Nyl.) — Lirellae unknown in recent collections. Disc slit-like, very narrow. Asci cylindrical-clavate, 47—53 × 10—12 μ. Spores elongate-fusiform, 6—7-celled, 22.7—29.6 × 3—3.9 μ. Pycnidia numerous, globose, projecting above the level of the thallus, dark brown under a white mealy covering. Pycnoconidia straight, 4.5—5.4(6.3) × 0.9—1.3 μ.

The old herbarium contains a fair number of what was then known as *Lecanactis abietina* (Abeleven, 1898. 45). On examining these collections it appears that some of them are actually referable to that species, others to *Opegrapha fuscella.*

Not previously recorded.

Friesland: Jelsum, 12 VIII 1951, *Barkman 3190,* on *Ulmus* (det. Almborn) (L); *Barkman 3425,* on *Ulmus* (L); Oenkerk, 13 VIII 1951, *Barkman 3186,* on *Ulmus* (det. Almborn) (L); *Barkman 3417,* on *Ulmus* (L); Veenklooster, 14 VIII 1951, *Barkman 3191,* on *Fagus* (det. Almborn) (L).

Groningen: Groningen, no date, *Van Hall,* on *Tilia,* c. apoth. (L); III 1855, *Acker Stratingh,* on *Quercus,* c. apoth. (Gro); Groningen, Heerepoort, IV 1853, *Van Hall* (?) (Gro); Groningen, Sterrebosch, no date, *Acker Stratingh,* on *Quercus,* c. apoth. (Gro); Haren, 18 III 1854, *Van Hall* (?), c. apoth. (Gro).

Overijsel: near Kampen, V 1889, *Top* (L).

Gelderland: Apeldoorn, Soerense bos, 19 VIII 1849, *Van der Sande Lacoste,* on *Quercus* (NBV); Uddel, Uddelermeer, 1849, bot. excurs., on *Quercus,* c. apoth. (NBV).

Utrecht: Vreeland, IV 1873, *Oudemans,* on *Salix* (Gro).

Noord-Holland: Osdorp, IX 1849, *Van der Sande Lacoste,* on *Salix,* c. apoth. (L, NBV); Texel: Den Burg-Oude Schild, 31 VIII 1951, *Barkman 3118,* on *Ulmus* (det. Almborn) (L).

Zuid-Holland: 's-Gravenhage, Haagse bos, IV 1850, *Van der Sande Lacoste,* c. apoth. (L).

Noord-Bragant: Breda, 1841, *Van der Sande Lacoste,* on *Salix* (NBV); Den Dungen, 19 XI 1922, *Wakker,* on *Salix* (L); Helvoirt, 25 V 1903, *Wakker,* on *Quercus,* c. apoth. (L); Vucht, 25 XI 1901, *Wakker,* on *Quercus,* c. apoth. (L); 1 II 1904, *Wakker,* on *Salix,* c. apoth. (L).

O. pulicaris (Hoffm.) Schrad. — Disc broadly dilated in the centre. Asci cylindrical-clavate, (45)55—70(75) × (12)14—18(20) μ. Spores vestigiiform to somewhat fusiform, 5—6-celled, (15.8)19.7—25.6(30.5) × (4.9)5.9—7.9(9.9) μ. Pycnoconidia straight to somewhat curved, (3)4—5(6) × ± 1 μ.

As to the shape of the lirellae, *O. pulicaris* may in some cases resemble *O. lichenoides,* a species I have not had yet the occasion to study in this country. If, as forwarded by Redinger (1938. 370—371, 375), the presence or absence of the excipular margin should be the only character by which to tell one species from the other, the difference is very slight indeed, since this character lacks constancy. The height of the epithecium might prove of better value. It is interesting to note that recently Faurel, Ozenda and Schotter (1953. 29) again stress the desirability of lumping both species.

Abeleven (1898. 46) recorded a single find by Van Hall from Groningen. This specimen turned out to be *Hysterium pulicare* Pers. ex Fr., whereas several collections of true *O. pulicaris* appeared preserved under various other names.

Friesland: Boekhorst (there is more than one locality of this name; unknown which is meant), 2 XII 1860, *Sprée,* on *Salix* (NBV); Paesens, 15 VIII 1951, *Barkman 3341,* on *Ulmus* (L); Veenklooster, 14 VIII 1951, *Barkman 3363, 3427* on *Fagus* (L); Veenwouden—Zwaag-Westeinde, 12 XII 1869, *Sprée,* on *Salix* (NBV); Vlieland: Westvlieland, 3 IX 1951, *Barkman 3382,* on *Populus* (L).

Groningen: Groningen, no date, *Van Hall* (L); Haren, Helpman, no date, *Acker Stratingh,* on *Ulmus* (Gro, NBV); 18 III 1854, *Acker Stratingh,* on *Quercus* (Gro, L); Ter Apel, klooster, 29 IX 1950, *Barkman 3422,* on *Fraxinus* (L).

Drente: Smilde, no date, *Van den Bosch* (NBV).

Gelderland: Beesd, 7 VII 1951, *Barkman 3387, 3388,* on *Ulmus* (L); Nijmegen, Uilenput, II 1872, *Van Hall,* on *Juglans* (L); Twello, no date, *Bondam* (NBV); Zutfen-Doesburg, 5 VIII 1951, *Barkman 3430,* on *Populus* (L).

Utrecht: Utrecht, IX 1837, *Wttewaal,* on *Salix* (NBV); 1841, *Van der Sande Lacoste* (NBV); 1841, *Van der Sande Lacoste,* on *Salix* (NBV); 1842, *Van der Sande*

Lacoste, on *Salix* (NBV); Vreeland, IV 1873, *Oudemans 954*, on *Salix* (Gro, L); Zuilen, 1841, *Van der Sande Lacoste* (NBV).

Noord-Holland: Amsterdam, 1849, *Van der Sande Lacoste* (NBV); Amsterdam-Amstelveen, 1849, *Van der Sande Lacoste*, on *Ulmus*, approaching *O. lichenoides* (NBV); Amsterdam, Weesperzijde, XI 1848, *Van der Sande Lacoste*, on *Ulmus* (NBV); Bergen, 20 IX 1943, *Barkman 601*, on *Ulmus* (L); Bergen, Breelaan, 30 IV 1954, *Reijnders*, on *Ulmus* (Reijnders); Bergen-Egmond, De Voert, 12 V 1954, *Maas G. 9673*, on *Ulmus* (L); Haarlem, Haarlemmerhout, no date, *Van Hall* (NBV); Vogelenzang, 1855, *Van den Bosch*, on *Quercus* (NBV).

Zuid-Holland: Lisse, Keukenhof, 23 III 1921, *Ten Kate*, on *Ulmus* (L).

Zeeland: Schouwen: Schuddebeurs, Heesterlust, 21 IX 1951, *Barkman 3394*, on *Ulmus* (L); Walcheren: Oostkapelle, 25 IX 1951, *Barkman 3401*, on *Ulmus* (L); Zuid-Beveland: locality not specified, III 1841, *Van den Bosch*, on *Salix* (NBV); IX 1842, *Van den Bosch*, on *Salix*, approaching *O. lichenoides* (NBV); Goes, 1843, *Van den Bosch*, on *Salix* (NBV); Kapelle, V 1839, *Van den Bosch*, on *Tilia* (NBV).

Noord-Brabant: Berlicum, 2 III 1902, *Wakker*, on *Salix* (L); Esch, 21 II 1912, *Wakker*, on *Salix* (L); Gestel, 15 XII 1901, *Wakker*, on *Quercus* (L); Hintham, IV 1901, *Wakker* (L).

O. rubescens Sandst. — Thallus greyish white, K + vinaceous around the lirellae. Disc black, slit-like. Hymenium colourless for $^2/_3$ of the total height, J + vinaceous red-brown, the upper part brown, J + blue-green. Asci cylindrical-clavate, 8-spored, 49.5—53 × 10—12 μ. Spores vestigiiform to fusiform, 4-celled, 14.8—15.8 × 3.9—5.5 μ. Pycnoconidia bacilliform, somewhat tapering towards one or both ends, straight or slightly curved, 15.8—18.7 × 1.5 μ.

The species seems variable as to the number of spores per ascus. Redinger (1938. 328) describes the asci as 4—6-spored.

New to the flora.

Gelderland: Beekhuizen, 19 IV 1951, *Maas G. 7675*, on *Fagus* at edge of wood near rivulet (L).

O. rufescens Pers. (*O. herpetica* (Ach.) Ach.) — Thallus yellowish brown to olive-brown. Disc slit-like. Asci cylindrical-clavate, 50—55 × 12—14 μ. Spores fusiform, 4-celled, straight or somewhat curved, 17.7—19.7 × 3.9—5.5 μ.

Although no recent finds are known, it may be not out of place to make the following comment upon the present species.

Abeleven (1898. 47) recorded some localities of what was then called *O. herpetica*, whereas many more are substantiated by material in the herbarium. It appears, however, that with the exception of the material from Utrecht no collection was correctly identified.

Utrecht: Utrecht, 1841, *Van der Sande Lacoste*, on *Fraxinus* (NBV).

Noord-Brabant: Cromvoirt, 3 XII 1904, *Wakker*, on *Fraxinus*, *Salix* (L).

O. subsiderella (Nyl.) Arn. — Disc slit-like. Asci cylindrical-clavate, 50—65(70) × (10)12—14 μ. Spores elongate-vestigiiform, 5—7-celled, (17.7) 22.5—28(39.4) × 3—4 μ. Pycnoconidia curved to falcate (rarely straight), (3.9)5—7(7.9) × 1—1.5 μ.

New to the flora.

Groningen: Warffum, Groot Zeewijk, 23 IX 1950, *Barkman 3360*, on *Ulmus* (L).

Overijsel: Dalfsen, 16 X 1951, *Barkman 3434*, on *Juglans* (L).

Gelderland: Elspeet, Vierhouter bos, 25 IV 1951, *Barkman 3407*, on *Fagus* (L).

Noord-Holland: Texel: De Koog, 1 IX 1951, *Barkman 3415*, on *Salix* (L); Prins Hendrikpolder, Capnie's burg, 31 VIII 1951, *Barkman 3409*, on *Ulmus* (L).

Zuid-Holland: Voorne: Rockanje, Windgat, 3 V 1953, *Maas G. 9383*, on *Salix* (L).

Noord-Brabant: Helvoirt (?), Molenstraat, 12 XI 1904, *Wakker*, on *Salix* (L); Vucht, Sionsburg, 9 XII 1922, *Wakker*, on *Salix* (L).

PARMELIA Ach.

P. aspera Mass. — After having written that the species was not known to have been collected in recent times (Maas Geesteranus, 1947), the following specimen came to my hands.

Zeeland: Walcheren: Nieuw en St. Joosland, 23 VII 1946, *C. Brakman*, on *Populus* (L).

PELTIGERA Pers.

P. scabrosa Th. Fr. — New to the flora.

Zuid-Holland: Voorne: Rockanje, north of Brede Water, 3 V 1953, *Maas G. 9326*, on calcareous sand in moist, low dunes in very sparse vegetation of *Ammophila arenaria* (L).

PHLYCTIS (Wallr.) Flot.

Phl. argena (Ach.) Flot. — Thallus usually strongly verrucose, often so badly developed as to be almost unrecognisable. Smooth thalli are rare and seem to be restricted to very sheltered habitats only.

Not previously recorded.

Friesland: Beetsterzwaag, 9 VIII 1951, *Barkman 3192*, on *Acer pseudoplatanus* (det. Almborn) (L); Veenklooster, 14 VIII 1951, *Barkman 3166c*, base of *Fagus* (confirmed Almborn) (L).

Drente: Ansen-Uffelte, 18 VIII 1954, *Maas G. 10031*, on *Quercus* (L); Dwingelo, 18 VIII 1954, *Maas G. 10030*, on *Quercus* (L); Dwingelo-Beilen, Lheebroekerzand, 14 VIII 1954, *Maas G. 10017*, on *Quercus* (L).

Overijsel: Deventer, 10 X 1951, *Barkman 3216*, on *Acer* (confirmed Almborn) (L).

Gelderland: Beesd, 7 VII 1951, *Barkman 3183*, on *Ulmus* (det. Almborn) (L); south of Deventer, 4 VIII 1951, *Barkman 3174*, on *Ulmus* (confirmed Almborn) (L); Hoog Keppel, 24 VII 1951, *Barkman 3176*, on *Quercus* (det. Almborn) (L); Winterswijk, Bekkendelle, 26 VII 1951, *Barkman 3167*, on *Ulmus* (confirmed Almborn) (L).

Utrecht: Haarzuilens, De Haar, 7 IX 1943, *Maas G. 2789*, on *Acer negundo* (confirmed Almborn) (L); Harmelen, 7 IX 1943, *Maas G. 2796*, on *Salix* (confirmed Almborn) (L); Vleuten, 7 IX 1943, *Maas G.*, on *Salix* (confirmed Almborn) (L).

Noord-Holland: Alkmaar-Heiloo, 16 IX 1943, *Barkman 620*, on *Ulmus* (confirmed Almborn) (L); Bergen, Eeuwige laan, 30 IV 1954, *Reijnders*, on *Quercus* (L); Bergen, Franschman, 12 V 1954, *Maas G. 9661*, on *Ulmus* (L); Enkhuizen-Hoorn, 8 IX 1951, *Barkman 3194*, on *Ulmus* (confirmed Almborn) (L); St. Maartensbrug, Wildrijk, 29 IX 1943, *Barkman 595*, on *Ulmus* (confirmed Almborn) (L).

Zuid-Holland: Den Deyl-Leiden, Zuidwijk, 22 VIII 1943, *Barkman*, on *Salix* (confirmed Almborn) (L); De Zilk, 26 V 1947, *Barkman 4188*, on *Ulmus* (L); Dordrecht, Kop van het Land, 22 VII 1951, *Barkman 3181*, on *Ulmus* (det. Almborn) (L); Oegstgeest, Oud-Poelgeest, 2 V 1922, *Ten Kate*, on *Populus* (L); Voorne: Oostvoorne, Mildenburg, 2 V 1953, *Barkman 4153*, on *Ulmus*; *Maas G. 9370*, on *Populus* (L); Wassenaar, Meiendel, 6 VI 1951, *Maas G. 7725*, on *Ulmus* (L).

Zeeland: Schouwen: Haamstede, 19 VII 1952, *Walrecht*, on *Acer* (L); Walcheren: Oostkapelle, Randduin, 30 IV 1952, *Walrecht*, on *Quercus* (L); Zuid-Beveland: Goes, no date, *Van den Bosch*, on *Salix* (Gro); 12 XI 1943, *Maas G. 2952b*, on *Ulmus* (det. Almborn); *Maas G. 2953*, on *Ulmus* (L); Kapelle, Postweg, 9 V 1952, *Walrecht*, on *Ulmus* (L); Kloetinge, 3 IV 1952, *Walrecht*, on *Ulmus* (L); Wolphaartsdijk, 23 IX 1951, *Barkman 2850*, on *Ulmus* (confirmed Almborn) (L).

Noord-Brabant: Bergen op Zoom, 11 XI 1943, *Maas G. 2900*, on *Quercus* (confirmed Almborn) (L); Lage Zwaluwe, 3 VII 1951, *Barkman 3177*, on *Ulmus* (confirmed Almborn) (L); Nuland, Wolfsdijk, 26 XI 1904, *Wakker*, on *Fagus* (L); Udenhout-Helvoirt, 31 V 1908, *Wakker*, on *Populus* (L).

PHYSCIA (Ach.) Vain.

Ph. nigricans (Flk.) Stizenb. — After the paper on indigenous *Physciaceae* had appeared (Maas Geesteranus, 1952) Dr Stafleu sent me his recent collections which, unpardonably, had escaped my attention. They contain among others fine material of the present species from a station which is the second in recent times.

Utrecht: Utrecht, 't Hemeltje, IV 1952, *Stafleu,* on concrete of pill-box, c. apoth. (U); 26 IV 1954, *Maas G. 9631, 9645,* c. apoth. (L).

PORINA Müll. Arg.

P. affinis (Mass.) A. Zahlbr. — Thallus whitish. Perithecia hemispherical with flattened top and base, ± 150 μ high, ± 190 μ diam. Excipulum carbonaceous, dimidiate, 30—40 μ thick, N —. Hymenium J —. Asci cylindrical, 8-spored, 51—65 × 8—10 μ. Spores obliquely 2—2.5-seriate, colourless, fusiform-ellipsoidal, 4-celled, 13.8—15.8 × 4—4.9 μ. Paraphyses filiform, simple, septate.

New to the flora.

Noord-Brabant: Cuik, Coebax, 2 VI 1907, *Wakker,* on *Quercus* (L).

P. chlorotica (Ach.) Müll. Arg. var. **carpinea** (Pers.) Keissl. — Thallus olivaceous, K —. Excipulum dark brown, involucrellum carbonaceous, 20—35 μ, both N + red-brown. Asci cylindrical, 8-spored, J —, (35)58—75(90) × (6)8—10(12) μ. Spores obliquely 1-seriate to 2-seriate, colourless, fusiform, 4-celled, cells cylindrical, (15.8)17.7—19.7(21.7) × (3.5)4—5(5.9) μ. Paraphyses free, filiform, septate, simple but occasionally also furcate, not anastomosing, straight or flexuous.

New to the flora.

Friesland: Bakkeveen, 8 VIII 1951, *Barkman,* on *Fagus* (L).

Gelderland: Beekhuizen, 20 IV 1951, *Barkman 3120,* on *Fagus* (L); Elspeet, Elspeter bos, 23 IV 1951, *Barkman 3383,* on *Fagus* (confirmed Magnusson) (L); Rheden, Middachten, 21 IV 1951, *Barkman 3471,* on *Quercus borealis* (L); Winterswijk, Bekkendelle, 10 VI 1949, *Barkman 4190,* on *Salix* (L).

Noord-Holland: Bergen-Binnen, 23 IX 1943, *Barkman 4185,* on *Fagus* (L); Bergen-Egmont, De Voert, 12 V 1954, *Maas G. 9671,* on *Acer* (L).

Zuid-Holland: De Zilk, 26 V 1947, *Maas G. 8494,* on *Ulmus* (L); Goeree: dunal region, 15 IV 1952, *Barkman 2897,* on *Ulmus* (L).

Zeeland: Schouwen: Haamstede, 20 IX 1951, *Barkman 3414b,* on *Populus* (L); Schuddebeurs, 21 IX 1951, *Barkman 3108, 3429b,* on *Ulmus* (L).

Noord-Brabant: Breda, 1841, *Van der Sande Lacoste,* on *Salix* (NBV); Ophemert, 5 VII 1951, *Barkman 3435c,* on *Juglans* (L); Vucht, 24 XII 1904, *Wakker,* on *Fagus* (L).

P. olivacea (Borr.) A. L. Sm. — Thallus olivaceous. Asci fusiform, 8-spored, J —, 80—100 × 10 μ. Spores colourless, acicular-fusiform, 7—8-celled, 25.6—31.5 × 3.9—4.9 μ. Paraphyses simple. Material scanty.

New to the flora.

Friesland: Veenklooster, 14 VIII 1951, *Barkman 3165,* on *Fagus* (L).

STAUROTHELE Norm. em. Th. Fr.

St. catalepta (Ach.) Blombg. & Forss. — Thallus fulvous, thick, areolate, fertile areoles hardly larger than the sterile ones. Perithecia immersed, subspherical, flattened at the top, 300—350 μ in diam., circumostiolar part dark brown. Excipulum consisting of a colourless, 14—20 μ thick inner lining, and a brownish, 10—25 μ thick outer wall which around the ostiolum turns dark brown and broadens considerably into an involucrellum-like structure. Hypothecium obscurely delimited, yellowish. Asci clavate-saccate, up to 20 μ broad, 2-spored. Spores at first colourless, later on dark-brown, cylindrical-ellipsoidal, muriform, 33.5—39.4 × 13.8—17.7 μ. Paraphyses absent. Periphyses colourless, 23—30 μ long, straight, free. Hymenial gelatina J + blue. Hymenial gonidia globose to ellipsoidal, frequently angular, sometimes 2-celled, 4—5 μ.

New to the flora.

Zuid-Holland: Ammerstol-Schoonhoven, 19 VIII 1942, *Maas G. 2148*, on basalt of the dike along the river Lek (L).

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UEBER ZWEI NEUE VERRUCARIACEAE

von

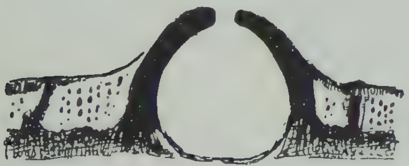
M. SERVÍT

(Petlery p. Klášterec)

(Herausgegeben am 18. XII. 1954)

Verrucaria maas-geesterani Servít sp. n. (*fig. 1*).

Thallus epilithinus, maculas 1—4 cm latas formans, atrofuscescens, H_2O ater, sat tenuis, continuus vel h. i. imperfecte rimulosus, superficie verruculis atris 0.03 mm latis ± tecta et levissime asperata, protothallo indistincto. Stratum corticale usque ad cca 20 μ altum, p.p. pallidum usque ad fuscum, p.p. nigrum, cellulis in partibus pallidioribus ut in strato basali, in partibus atris ad 4 μ in diam. Stratum algarum 40—80 μ altum, prosoplectenchymaticum, cellulis 4—6 μ altis, 3—4 μ latis, algis 6—12 μ altis, 4—6 μ latis, in seriebus sat distinctis verticalibus, incoloratum, maculis obscuris interruptum. Stratum basale fusco-atrum vel carbonaceum, usque ad 60 μ altum, supra cum maculis obscuris strati algarum concrescens.



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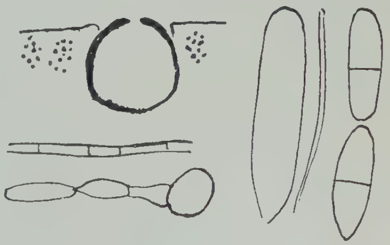

2

Fig. 1. — *Verrucaria maas-geesterani*: Querschnitt; fig. 2. — *Geisleria alpina*: Querschnitt, Hyphen des Hypothallus, Ascus, Periphyse, 2 Sporen.

Perithecia De 50—100. Pars emergens hemisphaerica, nigra, infra ± thallo tecta, 0.25—0.3 mm lata. Excipulum subimmersum, globosum fere, ad 200 μ diam., fuscum, supra fusco-atrum. Involucrellum dimidiatum, infra cum strato basale thallino confluens, ad 80 μ crassum. Periphyses cca 20 μ longae, 1.5 μ latae. Asci cylindrico-clavati, 80—100 μ alti, ad 24 μ lati, membrana apicalis 1.5 μ crassa. Sporae 2-seriales, ellipsoideae, apicibus late rotundatis, 20—28 μ longae, 13—16 μ latae, membrana 0.3 μ crassa.

J: Nucleus sanguineus, contentus ascorum obscure purpureus.

HELVETIA: Ticino, inter Meride et Serpiano, ad saxa non-calcarea, inundata, 30 V 1946, leg. *Maas Geesteranus 3419.*

Belegexemplare in Rijksherbarium, Leiden und im Herbar des Autors.

Von den schwarzen Wasser-Verrucarien steht die neue Art der *V. irmscheriana* am nächsten. Sie unterscheidet sich jedoch von derjenigen deutlich schon durch nackten Oberteil der Perithezien und kürzere und breitere Sporen.

Ziemlich ähnlich ist auch *V. alpicola* f. *abbreviata* Serv., doch ist das Lager dieser Flechte braun, nicht schwarz.

GEISLERIA Nitschke emend. Servít

Nitschke in Rabenh. Fl. Eur. No 574. 1861.

Thallus crustaceus, algae pleurococcoideae. Perithecium simplex, rectum, ostiolum orbiculare, terminale. Involucrellum nullum. Algae nucleares nullae, paraphyses permanentes, sporae vulgo octonae, septis transversalibus non multis divisae.

Geisleria alpina Servít sp. n. (*fig. 2*).

Thallus endocalcinus, superficies calcis laevigata, testacea. Stratum corticale nullum. Stratum algarum endocalcinum, hyphis ad 2 μ latis sat dense contextis, algae 5—7 μ diam. glomeratae. Hyphae hypothallinae 2—3 μ latae, cellulis cylindricis aut inflatis, usque ad globosis 8 μ diam.

Perithecia De cca 100, immersa. Pars desuper visibilis ad 0.15 mm lata, convexa, mox thallum superans, nigra. Excipulum globosum, 150 μ diam., rubro-fuscum, tenue, infra ad 8 μ crassum, cellulis 5—6 μ longis, 0.8 μ latis. Periphyses cca 18 μ longae, 0.8 μ latae. Asci cylindrici 30—40 μ longae, 10—14 μ latae, membrana apicalis 1 μ crassa. Sporae 1—2-seriales, oblongae vel ellipsoideo-oblongae usque ad fusiformes fere, 1-septatae, 13—15 μ longae, 4—5 μ latae, membrana 0.3 μ crassa.

J: Nucleus roseus, ascoplasma fulvescens.

AUSTRIA: Vorarlberg, Bregenzerwald, Damüls, calc. in rivulo Krumbach, 1400 m, 3 VII 1952, leg. *Maas Geesteranus 8594 b.*

Belegexemplare in Rijksherbarium, Leiden und im Herbar des Autors.

Unauffällige Pflanze auf dem von ausgefallenen Früchten anderer Flechten (*Amphoroblastia alpina* (Zsch.) Serv.) grubigem Kalkstein. *Didymella sphinctrinoides* muss nach der Beschreibung recht ähnlich sein, nur sollen dort die Paraphysen verzweigt sein, was hier nicht beobachtet wurde, die Sporen deutlich grösser und mit ungleichen Zellen.

MISCELLANEOUS BOTANICAL NOTES VI [1]

by

C. G. G. J. VAN STEENIS

(Flora Malesiana Foundation, Leiden)

(Issued 18. XII. 1954).

47. EXBUCKLANDIA R. W. BROWN (Hamam.).

Exbucklandia R. W. Brown (*Bucklandia* R. Br. non Pr. ex Sternb., *Symingtonia* Steen.)

In an article on "Alterations in some fossil and living floras" (J. Wash. Ac. Sc. 36: 348. Oct. 1946) R. W. Brown proposed the new generic name *Exbucklandia* for the Hamamelidaceous genus *Bucklandia* R. Br., non Pr. ex Sternb., while describing a new fossil species from the United States. He also transferred *B. populnea* to the new genus. Unfortunately I had overlooked this publication when proposing *Symingtonia* to replace *Bucklandia* R. Br. (Acta Bot. Neerl. 1: 443—444. 1952). *Exbucklandia* will have to be accepted for it in future. The Indo-Chinese species *B. tonkinensis* Lecomte should be referred to as *Exbucklandia tonkinensis* (Lecomte) Steen. comb. nov. I have to thank Dr E. H. Walker for pointing my attention to R. W. Brown's paper.

48. DROSERA SPATHULATA LABILL. IN THE MALAY PENINSULA.

In the Malay Peninsula *D. burmanni* Vahl has been found both at low altitude — which is normal — and occurs rather seldom at higher altitude (Kedah Peak). Among the sheets from Kedah Peak, received for checking from the Singapore Herbarium, I found one specimen which represents undoubtedly *D. spathulata* Labill., a rather rare species in Malaysia notwithstanding its wide distribution (S. Japan and China as far as Tasmania and New Zealand). The specimen was collected by Dr Holttum, April 2nd, 1925, in dwarf forest by stream, flowers mauve (*Holttum 14880*, SING).

49. A NEW COMBINATION IN ZIZYPHUS (Rhamnac.).

Zizyphus grewioides (Warb.) Perry, comb. nov. — *Celtis grewioides* Warb. Bot. Jahrb. 13: 287. 1891. — *Zizyphus inermis* Merr. Govt Lab.

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[1]) The first paper in this series appeared in Bull. Bot. Gard. Btzg III, 17: 383—411. 1948; the 2nd in Blumea 6: 243—246. 1948; the 3rd in Bull. Bot. Gard. Btzg III, 18: 457—461. 1950; the 4th in Reinwardtia 1: 467—481. 1952; the 5th in Acta Bot. Neerl. 2: 298—307. 1953.

Publ. (Philip.) 35: 37. 1906; En. Philip. Fl. Pl. 3: 522. 1923; & Perry, J. Arn. Arb. 20: 337. 1939, excl. spec. celeb. — *Zizyphus forbesii* Baker f. J. Bot. 61 Suppl.: 10. 1923.

Representative collections:

Sumatra. Bencoolen, N. of lake Ranau, 600—700 m, 29. 10. '29: *Van Steenis 3396.*

Malay Peninsula. Pahang, Tembeling, low alt., 12. 7. '29: *Henderson S.F. 21808* (distributed under the erroneous name *Z. affinis* Hemsl.).

Borneo. S. E. Borneo, Pleihari, 200 m, 12. 1. 30: *NIFS bb 14099;* Bukit Tjihan, 10. 12. '98: *Amdjah 314.*

Celebes. Malili, 50 m: *NIFS bb 23914.*

Philippines. Luzon, Rizal Prov., Nov. 1914: *Ramos 1960*; Laguna Prov., Sept. 1912: *Ramos 1564*; Irosin, Mt Bulusan, Aug. 1916: *Elmer 16907* — Leyte, 4. 4. '14: *Wenzel 38* — Samar, 4. 1914: *Ramos 1656* — Mindanao, Cabadbaran, Mt. Urdaneta, 9. 1912: *Elmer 13917, 13360, 13292.*

Moluccas. W. Ceram, between Riring and Taniwel, 250—400 m, 2. 10. '18: *Rutten 1724.*

New Guinea. W. New Guinea, Pikpik c. 300 m, 18. 2. '37: *NIFS bb 22242*; Idore, c. 10 m, 3. 3. '37: *NIFS bb 22289* — N. E. New Guinea, Hatzfeldhafen: *Warburg 20810, type* of *Celtis grewioides Warb.* (B); Sepik: *Ledermann 6997* — S. E. New Guinea, Palmer River, c. 100 m, July 1936: *Brass 7180*; Sogeri: *Forbes 910, type* of *Z. forbesii* Baker f..

Solomons. Bougainville, 150 m, 7. 6. 30: *Kajewski 1826, 2197.*

This is a typical example of a widely distributed well-marked species, which has been described or misidentified under several names from widely spaced places. It is examplary for the rule that in genera, of which no general revisions have been made for the whole of Malaysia, it is very dangerous to describe new species.

It approaches *Z. timoriensis* DC., which is also unarmed, but according to Mr J. Weibel, who was so kind as to compare typical *Z. inermis* Merr. with the type of De Candolle at Geneva, *Z. timoriensis* DC. differs by ovate-oblong, much thinner leaves which possess a distinctly unequal, more or less rounded base; moreover, the indumentum of the twigs and inflorescence is different. There are several Timor specimens at Leyden which exactly match *Z. timoriensis,* e. g. Kupang: *W. H. de Vriese,* Dec. 1859; *Zippelius* (*Celtis rostrata* Zipp. msc); *De Voogd 2260*; *Teysmann H.B. 5102*; Timor-Rotty: *Spanoghe*; P. Semaoe: *De Voogd 2319* and one of N. Celebes: Minahassa, *Koorders 18543*, considered by Merrill to represent *Z. inermis* Merr.

50. PHYLLANTHERA IN NEW GUINEA (Asclep.).

The genus was as yet known only from Sumatra and the Malay Peninsula (cf. Bull. Bot. Gard. Btzg III, 18: 459. 1950), with 2 species; both of them appear also to occur in New Guinea.

Phyllanthera bifida Bl. N. New Guinea: Rouffaer River, zijrivier C, 250 m: *Docters van Leeuwen 10432* (BO).

Phyllanthera perakensis King & Gamble. N. New Guinea: Bernhard Bivouac, 50 m, on damp clay soil, July 29, 1938: *Meijer Drees 413* (BO).

51. DISTRIBUTION OF VENTILAGO OBLONGIFOLIA Bl. (Rhamnac.).

During a short excursion in the immediate neighbourhood of the Mountain Gardens, Tjibodas, Oct. 1953, my companion Mantri Nurta found some fallen fruits of a liana from which he succeeded to obtain specimens. They appeared to belong to *Ventilago oblongifolia* Bl., a rather rare species in Malaysia. The new locality is remarkable by its great altitude, the range being 15 m (P. Weh, Sula Sanana), 200 m (Leuwiliang), 500 m (S. Idjen), 700 m (Tjuramanis), 1400 m (Tjibodas).

52. SOME NEW RECORDS FROM P. TRANGAN IN THE ARU ISLANDS (S. MOLUCCAS).

The southernmost island of the Arus, SW. off New Guinea, P. Trangan, is distinctly different from the adjacent northern islands. Its coast breaks off in most places with an almost perpendicular cliff. Inland it shows wide undulating plateaux alternating with grasslands and savannahs. Apparently it is subject to a dry (monsoon) period. In many places the soil is very sandy and drainage considerable. The situation is thus distinctly different from the northern adjacent islands which are covered by rain-forest.

In Trangan the late Dr P. Buwalda found very curious plants and plant associations, of North Australian facies, exactly comparable to those which have been described from similar regions in South New Guinea, specifically in the Moresby area, the Fly River area, the Wassi Kussa area and apparently also occurring in the Merauke-Okaba area.

The trees of the Trangan savannah are mostly Myrtaceae (*Melaleuca leucadendron* L., *M. angustifolia* Gaertn., *M. symphyocarpa* F. v. M., *Agonis lysicephala* (F. v. M. & F. M. Bail.) F. M. Bail., Proteaceae (*Finschia, Grevillea, Banksia dentata* L. f.), Leguminosae (phyllodine *Acacia mangium* Willd.). *Eucalyptus* seems to be absent.

The open forest abounds with epiphytic *Hydnophytum* and *Myrmecodia*. In it an Australia-distributed climber is *Hibbertia scandens* (Willd.) Dryand.

The ground cover is rich in *Rhynchosporoideae*, several grasses (*Ectrosia*), several (as yet unidentified) *Restionaceae, Xyris oligantha* Steud., *Stylidium pedunculatum* R. Br., *Velleia spathulata* R. Br., of which several are otherwise only recorded from Australia.

Unfortunately Dr Buwalda did not publish anything on his collection. Neither did Beccari who, as a matter of fact, made the only earlier collection here, and in whose collections the presence of *Acacia mangium* Willd. and *Banksia dentata* L. f. proves that he visited typical spots of this un-Malaysian vegetation type.

The following records stress the above-mentioned interesting phytogeographical alliance between the 4 localities alluded to above and the Australian flora. The fact that the representatives are generally not specifically distinct from those of the Australian continent was long ago (1891) already found out by Warburg.

Cartonema sp. (Commel.).

P. TRANGAN: Kp. Sia, in savannah, few metres altitude, flowers yellow, July 8, 1938: *Buwalda 5515* (BO).

This is the first record of this genus outside Australia. The specimen of which duplicates were distributed under the erroneous name *Helmholtzia* sp. seems to be different from all 7 hitherto described species; its exact name will be considered in the forthcoming revision of the Commelinaceae in Flora Malesiana.

Leschenaultia filiformis R. Br. (Gooden.).

P. TRANGAN: savannahs near Kp. Sia, low altitude, flower pale lilac, fl. July 8, 1938: *Buwalda 5527* (BO).

Described from Australia, also recorded from the Wassi Kussa area (cf. Merrill & Perry, J. Arn. Arb. 30: 60. 1949).

Phacellotrix cladochaeta F. v. M. (Compos.).

P. TRANGAN: savannah near Kp. Ngaibor, few m alt., fl. yellow, June 23, 1938: *Buwalda 5359* (BO).

Described from N. Australia; also recorded from Wuroi (Oriomo River) and Gaima (Lower Fly) in South New Guinea, collected by Brass (det. Miss Dr J. Koster).

DIATOMS AS A MEANS FOR IDENTIFYING THE ORIGIN OF AQUATIC PLANTS

by

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(Hydrobiologist, Abcoude, Netherlands).

In 1934 Dr van Steenis recorded *Elisma natans* (L.) Buch. for the first time outside Europe, viz. from Java. This unusual record was based on a single specimen collected in 1932 by Dr A. Kleinhoonte in Central Java at 2000 m altitude on Mt Diëng, now preserved in the Herbarium Bogoriense. Miss Kleinhoonte assumed there was little doubt that she had collected it in Java. After having collected information from the Fisheries Department in Java, that no *Elisma* was ever planted by that Service, Dr van Steenis stated (1, p. 175): "Though it is a waterplant, I cannot account for this enormous discontinuity." A year later (2, p. 55) he gave a figure of the specimen and concluded that he felt forced to accept the species as a native of Java.

However, he nursed a feeling that there was something wrong in this forced assumption. The pools on Mt Diëng are easy to reach and have been subjected to repeated botanical field work by experienced botanists onwards of Junghuhn. His doubt was later still strengthened by the fact that shortly before the war, the late Mr J. G. T. Loogen, a planter and enthusiastic amateur-botanist living N. of Mt Diëng, repeatedly searched the spot where *Elisma* was said to be found but without success.

In 1953 Dr van Steenis readily accepted an ingenious suggestion by Prof. J. Heimans, Director of the Hugo de Vries Laboratory, Amsterdam. to the effect that a reliable argument pro or contra might still be found in the identity of microscopic algae and diatoms found as lasionts on the herbarium sheet.

In 1953 Dr Heimans searched the herbarium specimen, obtained through the courtesy of the Keeper of the Herbarium Bogoriense, for desmids and diatoms. He found only the latter (*Gomphonema* spec.) and entrusted me with the microscopic preparation.

The result of my identifications, consisting of 6 species and 2 varieties observed, has been tabulated below.

Of *Cymbella affinis* and *Synedra ulna* var. *danica* only one individual could be traced; the other taxa were found in greater quantity, specially the *Gomphonema* species.

All species are cosmopolitan, but are frequently not found together, specially not in the tropics. This appears from the tabulated record derived from data by F. Hustedt in his publications: "Systematische und ökologische Untersuchungen über die Diatomeenflora von Java, Bali und Sumatra" (1938) and „Süsswasserdiatomeen des Indo-Malayischen Archipels und der Hawaii Inseln" (1942), and as regards Porto Rico from the paper by R. Hagelstein "Diatomaceae of Porto Rico and the Virgin Islands" (1939).

Tabulated distribution of the *Elisma* diatoms

	Malaysia			Philippines				Hawaii		
Names of diatoms:	Java	Sumatra	Celebes	Mindanao	Jolo	Leyte	Luzon	Oahu	Kauai	Porto-Rico
Cymbella affinis Kütz.	c	+	+	—	—	+	+	—	—	c
Eunotia lunaris (Ehr.) Grun	c	+	+	+	—	+	+	—	—	c
Gomphonema acuminatum Ehr.	+	—	—	—	—	—	+	+	—	—
G. acum. var. coronata (Ehr.) W. Sm.	—	—	—	—	—	—	—	—	—	—
G. constrictum Ehr.	—	rr	—	—	—	—	—	r	—	c
G. parvulum Kütz.	+	+	c	+	+	—	c	c	c	cc
Synedra ulna (Nitzsch) Ehr. var. danica (Kütz.) Grun	+^{x}	rr	c	—	+	cc	cc	+	—	—
Tabellaria flocculosa (Roth) Kütz.	r	rr	+	+	—	—	c	c	c	—

x First recorded in 1942.
cc Everywhere very common.
c Everywhere distributed.
+ Locally occurring.
r Rarely found.
rr Only once found.
— Apparently absent.

Neither in Malaysia, nor in the Philippines, Hawaii and Porto Rico, all situated in the tropics at similar latitudes, do the species tabulated occur together, though the authors of the publications mentioned above, have examined samples from a fair number of localities. Hustedt examined also samples from Mt Diëng in about the locality where *Elisma* was said to have been collected.

Cymbella affinis is a common species in the tropics. *Eunotia lunaris* and *Gomphonema acuminatum* are rare in West and Central Java. *G. acuminatum* var. *coronata*, however, has never been recorded from the tropics, *G. constrictum* has never been recorded from Java and only once from Sumatra (Hustedt 1938). *Synedra ulna* is a widely spread species, recorded from Java and rarely occurring in Sumatra. *Tabellaria flocculosa* is an exclusive-halophobous species, occurring preferably in oligotrophous, humous water, p_H 4.5—7.5. It is common in Hawaii and Luzon, and has been found locally common in some places in Java.

Gomphonema acuminatum and its variety *coronata* and *G. constrictum* are common in Europe and occur in the Netherlands togteher with *Tabellaria flocculosa*, e. g. in the Kromme Waay, a pool near Heumen on the Meuse and in Het Hol, a boggy pool near Kortenhoef. Mayer records this combination for the Danube near Dillingen (1915) and Kolbe found it in the freshwater part of the oligo- to mesohaline Notte canal, a biotope where *Tabellaria* does not properly belong, but still occurred sparsely together with the three *Gomphonemas*.

Though it is not impossible, that in further examination of Malaysian waters the said species-combination might be found, I assume there is little chance after the meticulous researches by Hustedt in Java and Sumatra.

My conclusion is that through the combination *Tabellaria flocculosa*, which is rare in Java, with 3 *Gomphonemas*, of which one is rare and local and the other two have not been recorded from Java, it is most improbable that the *Elisma* specimen came from Java. Its origin was almost certainly Europe, more in particular the Netherlands.

The confusion is quite possibly due to the fact that, as Dr van Steenis told me, Miss Kleinhoonte dried her plants between used, grey, rough blotting sheets brought from Holland, to the underside of which a thin waterplant like *Elisma* might have by chance adhered and escaped attention, until the collection was in course of drying or properly examined for numbering or specific naming.

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¹) Bull. Jard. Bot. Buitenz. III, 13: 174—175, 1934.
²) De Trop. Natuur 34: 54—56, 1935.

FLORAE MALESIANAE PRECURSORES VIII.
THE GENUS CNESTIS (CONNARACEAE) IN INDO-MALAYSIA

by

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The family of Connaraceae has lately been treated in a monograph by G. Schellenberg in Engler's "Das Pflanzenreich" IV, 1938, 127. He divided the family into two subfamilies, *Jollydoroideae* and *Connaroideae*, the first of which, though having some derived characters, was considered the most primitive of the two on the strength of having two seeds in the fruits; in *Connaroideae* the fruits contain a single seed.

The genus *Cnestis* belongs to the *Connaroideae*; it was conceived by Schellenberg as the most primitive genus of this subfamily.

The flowers of *Cnestis* are pentamerous and pentacyclic. Only few or all five of the carpels of the apocarpous ovary do ripen into fruits. Ordinarily only one of the two ovules in a carpel turns into a seed, containing endosperm.

The genus *Cnestis* consists of shrubs and lianes and is mainly African. According to Schellenberg the Indo-Malaysian representatives belong to two species, viz *Cnestis palala* (Lour.) Merrill and *Cnestis diffusa* Blanco.

The dividing of the genus into the sections *Eucnestis* and *Ceratocnestis*, as provided by Schellenberg, primarily rests on the shape of the fruit and secondly on the type of its indumentum. The species of section *Eucnestis* have obtuse, pear-shaped fruits with only few long bristles amongst the short hairy indumentum, whereas in section *Ceratocnestis* the fruits are beaked and covered with numerous long hairs.

The Indo-Malaysian species mentioned above both would belong to the section *Eucnestis*. This section has been subdivided into two subsections, the *Brevipetalae* and *Aequipetalae*, which mainly differ from each other in the proportion of the length of their petals and sepals. In the *Brevipetalae* the petals are about half as long as the sepals; in the *Aequipetalae* the petals are of the same length as the sepals or even a bit longer. The inflorescences of the *Brevipetalae* are said to be terminal or born in the axils of the upper leaves and to have stronger axes than those in the subsection *Aequipetalae* in which the inflorescences would originate in the axils of leaves on older branches. Schellenberg refers the two Indo-Malaysian species *C. palala* and *C. diffusa* to the subsection *Aequipetalae*.

This implies the occurrence in this region of plants with obtuse fruits only and with petals as long as the sepals.

Many of the specimens from Indo-Malaysia examined by us had also been studied by Schellenberg; he has mentioned them in his monograph.

This material, however, turned out to be more heterogeneous than could be expected from Schellenberg's descriptions: *aequipetalae as well as brevipetalae and pear-shaped as well as beaked fruits could be traced.* The remaining material, not seen by Schellenberg, coincides with the former in polymorphy.

The types new to Indo-Malaysia (brevipetalous flowers and beaked fruits) apparently do not belong to species that have already been described from elsewhere. As a result of these findings two main problems arise: 1. how to subdivide the Indo-Malaysian material, and, 2. how to classify it in its relation to the African species of *Cnestis*.

1. Properties and variability of material.

a. Mutual relation of calyx and corolla.

Aequipetalous types: petals as long as sepals or longer (in our material up to 1 mm longer). Area: Malay Peninsula, Andaman Islands, Burma, Siam, Indo-China, Philippines[1]) (fig. 1).

Brevipetalous types: petals shorter than sepals (difference 1 mm minimal, 2.8 mm max.). Area: MP, Sumatra, Borneo, Celebes[2]) (fig. 1).

We may point to the fact that the terms aequi- and brevipetalae have been based here on the length ratio of petals and sepals only. They are not used in the sense of Schellenberg's subsections, which groups are said to show differences also in the structure of their inflorescences.

b. Fruits.

Two forms were found:

1. a beaked form: slightly falcate to lanceolate fruits; the beak, which is somewhat laterally compressed and curved, lies in prolongation of the fruit. Average size of the fruits 2.7 (limits 1.3—4.4) × 1.0 (limits 0.6—1.5) cm. These were found in the regions of A, B, S, IC (fig. 1). In but a few fruits we found the beaked form to be dubious. The presence of obviously beaked fruits on the same specimen, however, may serve as an indication that we can maintain the beaked fruit-shape as a general character.

2. pyriform: obliquely pear-shaped fruits with a rounded or slightly produced apex. These fruits are bigger in size than the beaked ones, 3.8 (3.0—5.0) × 1.9 (1.0—2.8) cm in average. Area: MP, Su, Bo, Ph (fig. 1); we did not see fruiting material from Celebes.

It is quite obvious that the difference in shape of the fruits coincides with a geographic separation. The borderline between both areas runs almost along the northern limit of Malay Peninsula. In Malaysia we find exclusively pear-shaped fruits, both in brevi- and aequipetalae.

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[1]) The names of these regions henceforth will be abbreviated to MP, A, B, S, IC and Ph.

[2]) Henceforth Su, Bo, C.

In the herbaria consulted the number of pear-shaped fruits was too small to enable a comparison of fruit-size between brevi- and aequipetalae. However, we get the impression that those of the brevipetalae are biggest. Merrill (1929) said: "the fruits of the Borneo form being much larger than those of the Philippine plants".

On the labels there are only few remarks on fruit colour; pear-shaped fruits are said to be yellow to dark red, whereas beaked fruits would be orange to red.

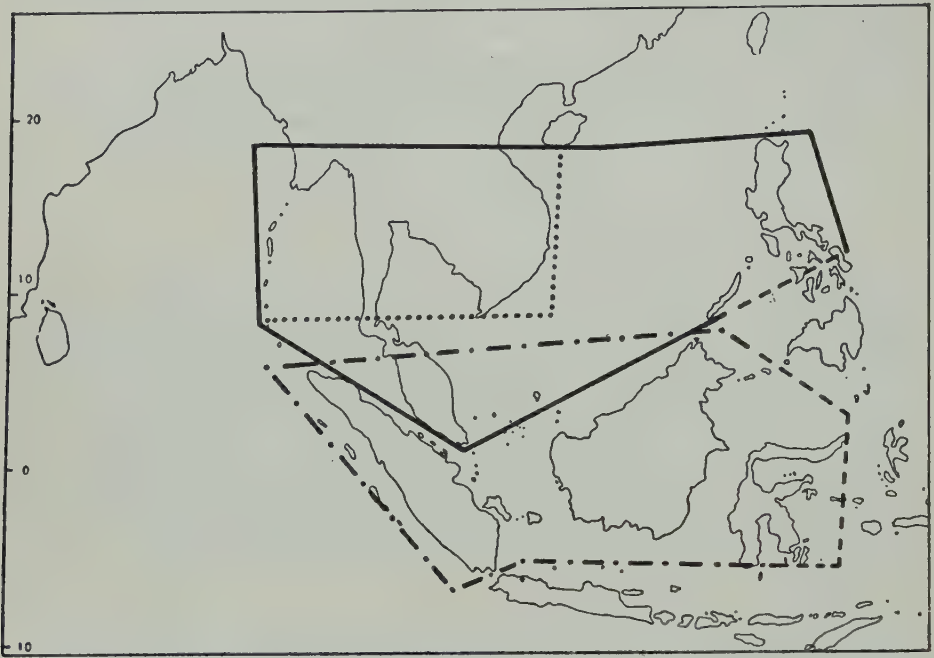


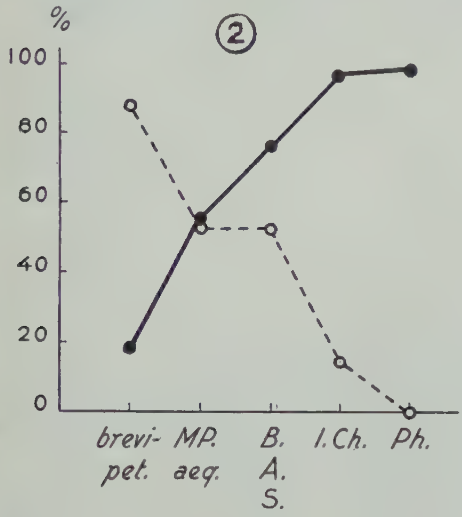
Fig. 1. Distribution of the species of *Cnestis* in Indo-Malaysia. —— Area of *C. palala* (Lour.) Merrill, composed of the areas of distribution of subsp. *palala* (......) and subsp. *diffusa* (Blanco) Andreas (remaining area of the species). · — · — · Area of *Cnestis platantha* Griff. - - - - Uncertain borderlines.

c. *Texture of petals.*

Part of the material of A, B, S, IC (16 out of 24 specimens) had fleshy petals, whereas all the other specimens had membranaceous petals.

d. *Indumentum of petals.*

In the character of hairiness the existence of a cline is remarkable. The percentage of hairy petals shows a decrease from the Philippines via IC, S, B, A to MP in aequipetalae, to reach the lowest value in the brevipetalae of MP, Su, Bo, C (fig. 2). The decreasing tendency in the indumentum of the petals is also apparent in the number of hairs per hairy petal. This number varies between 1 and ca 30. We find that a decrease of the percentage of hairy petals coincides with an increase in frequency of few hairs per hairy petal (fig. 2; few hairs = 1—4; the frequency of 1—4 hairs has been expressed in the percentage of the total number of pilose petals found in the proper region). There is no evidence for a possibly adaptive sense of the gradation in hairiness mentioned above; no probable relation is to be seen e.g. with a geographical or a climatological gradient. On the other hand one hardly can imagine such a gradient having arisen by mere chance. Statistically the differences between the percentages as represented in fig. 2 are, for the greater part, significant.



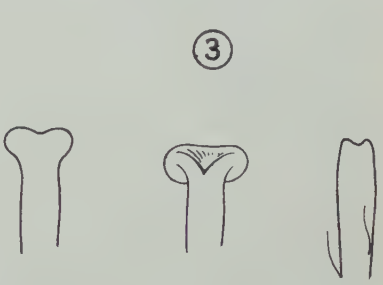


Fig. 2. ●——● Percentage of hairy petals.
○– – –○ Petals with only 1—4 hairs, as the percentage of the total number of hairy petals.

Fig. 3. Stigma types a, b and c (from left to right).

e. Indumentum of rhachis of inflorescence and of peduncle.

The indumentum is more or less dense and generally composed of bristles and glandular hairs. An exception should again be made for the area of A, B, S and IC, where 11 out of 27 specimens did not bear glandular hairs. The absence of this type of hairs, however, does not coincide with one of the two types of petals mentioned before (under c), which are fleshy or membranaceous. The peduncles tend to show breakage above the bracteoles; in this place the indumentum is more dense than elsewhere.

f. Stamens.

There are two whorls of 5 stamens each. We found the filaments to be free, whereas Schellenberg mentioned their being united at the base as a characteristic of the genus *Cnestis*; he depicted it in his monograph

(p. 31) in *Cnestis ferruginea.* The five outmost stamens are usually longer than the inner ones; mostly the difference is ¼ mm, sometimes ½ mm. In some of the specimens of A, MP and IC the stamens are equal in length. The length of the stamens varies between ½ mm and 4 mm. A frequency distribution is given in table I.

TABLE I.

Length of stamens	⩽1 mm	1¼ mm	1½ mm	2¼ mm	4 mm
brevipet.	9	2	1	2	3
aequipet. MP	5	8	4	—	—
A, B, S, IC	17	3	2	—	—
Ph	—	3	1	1	—

Remarkable features are the occurrence of rather long stamens (4 mm) in 3 specimens of brevipetalae and the occurrence of short stamens in many specimens in the region of A, B, S and IC (⩽1 mm).

The anthers are extrorse, as a result of the bending outward of the upper parts of the filaments. Schellenberg is of a different opinion. In his monograph we find the following description concerning the dehiscence of the anthers as a character common to all Connaraceae: "Die Antheren sind dorsifix, sie kippen bei der Anthese über".

g. Pistil.

The stigmas are of three different types (fig. 3). a. bud-shaped, bilobed; b. funnel-shaped, unilaterally collared; c. not thicker than the style and hardly bilobed. Table II represents the distribution of the three types (a, b, c = type of stigma; number indicates the number of specimens).

TABLE II.

Length of pistil	< 1¾ mm			⩽ 1¾ mm		
	a	b	c	a	b	c
brevipet.	2		3			11
aequipet. MP			11	3		5
A, B, S, IC	6	17	1		2	
Ph	5			2		
Total	13	17	15	5	2	16

Table III illustrates the differences found in length of stamens and pistils.

TABLE III.

	stamens longer (mm)					pistils longer (mm)		
Difference in length	3.25—4.25	2.25—3.25	1.25—2.25	0.25—2.25	0	0.25—1.25	1.25—2.25	2.25—3.25
brevipet.	1	2	1	2	0	8	7	1
aequipet. MP				4	0	14	1	
A, B, S, IC				5	9	6	1	
Ph				3	0	2		

There is a wider divergency of differences in length in brevipetalae than in aequipetalae. The plants of A, B, S and IC are different from other types by having stamens and pistils which may be equally long.

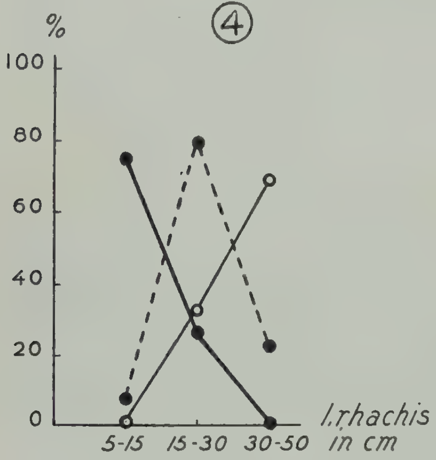
When consulting our data obtained on variation in length of styles, we might ask whether they point to heterotristyly or not. This character has been mentioned by Schellenberg as occurring in the whole family of Connaraceae. In A, B, S and IC we could speak of heterotristyly indeed; the absolute differences in length, however, are so small that their functional significance in pollination is rather doubtful. In other parts of the area the term tristyly seems rather arbitrary. As long as more data are not available, we consider the indication of variation in length of styles should be restricted to heterostyly.

It is remarkable that Schellenberg was the first author to speak of hermaphrodite flowers. His predecessors Bentham and Hooker (1862—'67), Kurz (1877), Hooker (1879), Boerlage (1890), King (1897), Lecomte (1908—'23), Ridley (1922) make mention of unisexual or polygamous-dioecious flowers of the genus *Cnestis*. Griffith (1854) did not make special remarks on the sex of the flowers. One gets the impression, however, that he described hermaphrodite flowers. It seems likely that stigma-type c (fig. 3) was considered as being sterile by Bentham and others. According to this opinion their description of male flowers could be understood. As we did not find stamens that could be considered to be sterile, there is no reason to distinguish female flowers either.

h. Leaves.

These are imparipinnate and have numerous jugae. Fig. 4, 5 and 6 respectively illustrate the frequency distribution in length of rhachis, number of pinnae and length of the leaflets. The brevipetalae are striking by high frequency in long rhachides (30—50 cm). In the aequipetalae of MP, A, B, S and Ph a rhachis length of 15—30 cm is frequent, whereas in the specimens of Indo-China lengths of only 5—15 cm are predominant. Besides, the plants of A, B, S, IC show high frequency in small number of jugae (6—11).

The acceptance in brevipetalae of high frequency for long rhachides and many pinnae appears to be statistically justified, but this is not the case as to long leaflets. As quantitative data on vegetative characters are concerned, one could produce objections against the handling of those characters as diagnostic. However, the difference in vegetative properties between a great number of brevipetalae at least on one side and the remaining material on the other is so striking, that we did not hesitate to use it as a co-argument in the discussion on the taxonomic segregation of our *Cnestis* material.



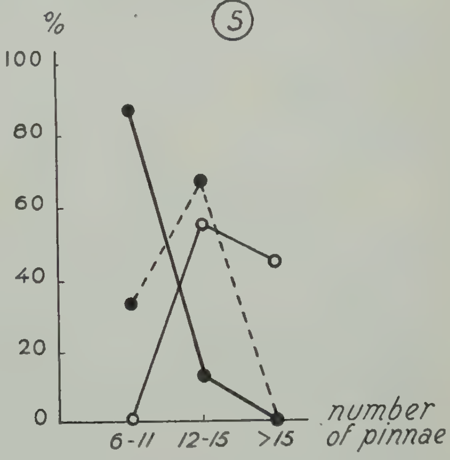


Fig. 4. Length of rhachis of leaves. ●——● Indo-China; ●- - -● Andam., Burma, Siam; almost the same in Mal. Pen. *aequipet.* and Philippines; ○——○ *Brevipetalae.*

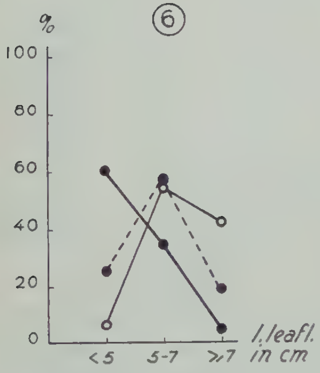
Fig. 5. ●——● Indo-China; almost the same in Andam., Burma, Siam; ●- - -● Philippines and *aequipet.* of Malay Peninsula; ○——○ *Brevipetalae.*

All over the area the shape of the leaflets varies between elliptical and oblong. The apex is acute, more or less acuminate or round. The variability is almost the same in every part of the region; thus its pattern is different from that described by Schellenberg. He mentions an acute leaflet apex as occurring in the Philippines only (*C. diffusa*), whereas in *C. palala* (remaining area) the acute apex should be absent.

The number of secundary nerves has also been used by Schellenberg as a diagnostic character. It varies from 6 to 10 but it should be remarked that the counting of these veins is by no means always easy. We found that in the localities in A, B, S, IC and MP in the aequipetalae the numbers 6—7 are commonest (in 88 % of the total number of specimens). With the aequipetalae of the Philippines and with the brevipetalae the percentage of 6—7 secundary nerves was found to be 44 % and 45 % respectively. Schellenberg, however, counted 4—6 secundary nerves in *Cnestis palala*, ca 10 in *C. diffusa.*

i. Texture of leaflets.

This varies from chartaceous to coriaceous. We could not corroborate Schellenberg's statement on an exclusive occurrence of a certain texture in a certain region. In many cases it is difficult to designate the texture because of the numerous gradual transitions. It is for this reason that we rejected the texture of the leaflets as a diagnostic character. At best we can say that the leaflets are rather thin in the Philippines and somewhat thicker in A, B, S, IC and MP.



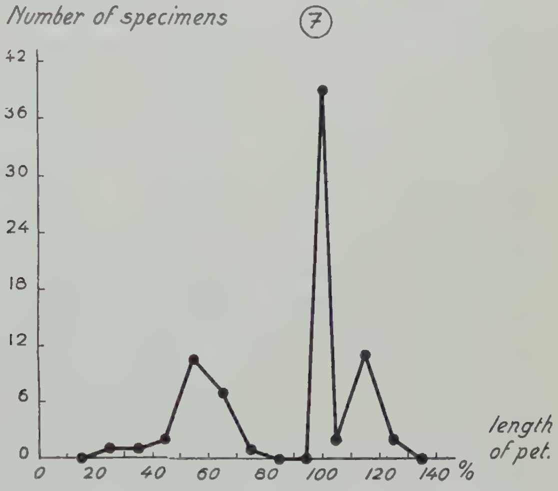


Fig. 6. Length of leaflets. ●——● Indo-China; almost the same in *aequipet.* of Malay Peninsula; ●– – –● Philippines; almost the same in Andam., Burma, Siam; o——o *Brevipetalae.*

Fig. 7. Frequency distribution of length ratio of petals and sepals. Petal length expressed as percentage of sepal length.

j. Indumentum of leaflets.

1. Upper side. Sometimes they are glabrous, sometimes hairy on the midrib only; sometimes sparsely hairy all over the surface, a little bit more dense on the midrib. In A, B, S and IC we rather often meet with glabrous or very sparsely hairy leaflets.

2. Lower side. More or less and ± frizzily hairy. Most of the indumentum is localized on the midrib and the edge of a leaflet; in these places the hairs are appressed and directed towards the apex of the leaflet.

In the north-westerly district of the area (A, B, S, IC) the appressed indumentum may also cover the bigger secundary nerves; this phenomenon, however, need not be accompanied by a denser hairiness of the remaining leaflet-blade.

We cannot follow Schellenberg in his opinion that the indumentum of the lower side of the leaflets in the Philippines is more sparse than in the other regions of the area of distribution.

2. Discussion of taxonomy

We now turn to the question which possibilities for a taxonomic classification are present in the pattern of variability discussed above.

Fig. 7 shows the distribution of frequency concerning the length ratio of petals and sepals as found by us. The length of petals has been expressed in % of sepal length; the numbers have been determined in stretches of 10 % each. The graph shows some striking facts. One is the normal frequency distribution between 20—80 % in a group, already previously distinguished by us as brevipetalae; another striking feature is the unilateral frequency distribution between 100—120 % in the group, previously distinguished as aequipetalae. Moreover, there is the obvious discontinuity between 80 and 100 %. The frequency distribution in the total stretch of 20—120 % herewith is such, that a division into two taxonomically distinguishable groups (aequi- and brevipetalae) is to be considered as justified. We should remark, however, that the possibility of not an absolutely unilateral frequency distribution in the aequipetalae remains on the strength of statistical considerations; for a character, not occurring within a sample of 52 specimens taken at random (number of aequipetalae investigated by us), nevertheless may be present in maximal 15 % of the entire population. (As to the determination of the percentage mentioned, we may refer to a table on sampling limits; Simpson and Roe, 1939). Herewith it is of course necessary to admit the herbarium collection to be representative for the population under discussion.

In our survey on the variability in the material studied it has been indicated that aequi- and brevipetalae show differences in various other points also:

— part of the brevipetalae are more obviously heterostylous (based on greater length of stamens and pistils);

— the indumentum on the petals is less in the brevipetalae, which appears from the percentage of glabrous petals as well as from the number of hairs on any hairy petal;

— as for the properties of the leaves the brevipetalae show higher frequency in bigger sizes and in more numerous jugae.

In these properties, the two groups do overlap more or less evidently, whereas they do not in the relation of lengths of sepals and petals.

However, as has already been mentioned, the discontinuity may be less distinct than we found it in the rather low number of specimens studied. The discontinuity even exists in MP, where the areas of aequi- and brevipetalae overlap (fig. 1). From this fact we conclude to a genetical diversity on the strength of which we gave species rank to both groups.

With respect to the fruit it may be emphasized that difference in shape involves geographic separation. Consequently the differential value of the fruit shape is restricted to the possible distinction of subspecies only. The geographic borderline runs within the area of aequipetalae (fig. 1) so that this species, on the strength of fruit shape, has been subdivided into:

α. subspecies with beaked fruit; A, B, S, IC.
β. „ „ pear-shaped fruit; MP, Ph.

Besides, subsp. *α* differs from the remaining taxa in its variability of texture of petals, which may be fleshy or membranaceous; further in the shape of the stigmas, which may be of three different types, two of which are also common in the remaining area. The third type means a unilaterally collared funnel-shaped stigma. Subspecies *α* also differs by the possible absence of glandular hairs on the rhachis of the inflorescence and on the peduncles.

With the brevipetalae the fruits are exclusively pear-shaped. (From Celebes no fruiting specimens have been seen).

It has already been mentioned that our two Indo-Malaysian species of *Cnestis* are not covering those of Schellenberg. For that reason a study of nomenclature became necessary.

The oldest valid name was *Thysanus palala* Lour. (Fl. Cochinch. 1790, 284). It was only later that Merrill related it to *Cnestis* (1922).

Loureiro cited, though with doubt, "Palala secunda?" of Rumphius, Herb. Amb. 1. 2. c. 9. pag. 26 tab. 6 as a synonym. According to Merrill (1935) Loureiro's description was not based on the latter plant, which is now considered to belong to the *Myristicaceae*.

It is regrettable that Loureiro's material could not be located up till now. This is the more regrettable as in his description of the genus he mentions a tetramerous pistil and four drupes in a flower which for the rest is pentamerous, so that there may exist some doubt concerning the real nature of *Thysanus palala* (Merrill 1922, 1935).

From Loureiro's description we cite:

"...... Pist. Germen tetragonum. Styli 4, filiformes, angulis, 4 germinis a latere inserti ...... Peric. Drupae 4, ..."

Merrill supposes Loureiro's description to be based on a faulty observation and he admits that the pistil be pentamerous. Consequently he transferred *Thysanus palala* Lour. (1790) to *Cnestis* Juss. (1789), under the name of *Cnestis palala* (Lour.) Merrill (1922).

"*Thysanus* Lour., long placed in the *Connaraceae* as a genus of doubtful status, is clearly the same as *Cnestis* Jussieu. *Thysanus palala* Lour. I believe to be identical with the rather widely distributed *Cnestis ramiflora* Griff.. *Palala secunda* Rumph. (Herb. Amb. 2: 26 pl. 6), cited by Loureiro as representing his species, and whence he derived his specific name, must be excluded as it represents the Myristicaceous *Horsfieldia sylvestris* Warb. Loureiro's description, however, was based on actual Indo-China specimens, not on *Palala secunda* Rumph. His description of the ovary and styles is not good for *Cnestis*, but I suspect that his data were based on faulty observations". (Merrill, 1935).

When describing Indo-Malaysian *Cnestis* from B, MP, Su, Ph as early as 1909, Merrill still named it *C. diffusa* Blanco. This name dates from

1837. However, when transferring *Thysanus palala* to the genus *Cnestis* and on distinguishing only one species in Malaysia, it is clear that the epithet *palala* possesses priority.

As the neotype of *Cnestis palala* Merrill chose a specimen Clemens 3805, collected in Tourane, Annam. In doing so he fixed the name. And we must follow him as long as we cannot prove the transfer to be incorrect, which only could be judged from Loureiro's original material.

The neotype Clemens 3805 is an aequipetalous specimen belonging to our aequipetalous species which therefore must be called *Cnestis palala* (Lour.) Merrill.

The neotype specimen bears no fruits, it is true, but also on the strength of its having been collected in Annam we consider it to belong to our subspecies with beaked fruits, occurring in the area A, B, S and IC. Since therefore this subspecies includes the neotype of the species it should be called *Cnestis palala* (Lour.) Merrill subsp. *palala*.

The other subspecies of *Cnestis palala* is the one of the Philippines and Malay Peninsula.

The next species published posterior to *Thysanus* (= *Cnestis*) *palala* was a Malaysian species, exactly coming from the region mentioned. Blanco described in Fl. Filip. 1837, p. 386 *Cnestis diffusa* and *C. corniculata*. The latter name, however, is now considered to be a synonym of the first, so that *Cnestis diffusa* Blanco became the name of the Philippine species. Its neotype is Cuming 951 (K).

Though this specimen also does not bear fruits, we nevertheless have classified it in our subspecies of MP and Ph on the strength of its aequipetalous flowers and its native region.

We were free in choosing a name for the subspecies because the transfer from the one species to the other is connected with a change of rank, while on the other hand there is no combination in the subspecies rank either to claim priority.

C. palala and *C. diffusa* mutually differ so little, it is true, that they have been united by Merrill under the name *C. palala* (Lour.) Merrill, but the author did not make mention of a subspecies. However, we have retained the epithet *diffusa* for the subspecies, because it was so well known in Philippine botany for over hundred years, where it covered a certain conception which, in the new situation, may be maintained. And apart from that there is no reason to introduce a new epithet either.

Therefore we named this subspecies (with pear-shaped fruits and occurring in MP and Ph) *Cnestis palala* (Lour.) Merrill subsp. *diffusa* (Blanco) Andreas.

1. **Cnestis palala** (Lour.) Merrill, J. Str. Br. Roy. As. Soc. no. 85, 1922, 201. — *C. diffusa* Blanco (1837) sensu Merrill, Philip. Journ. Sci. 4, 1909, Bot. 127.

Shrub, often climbing, to ca 10 m high. Young branches mostly crispately tomentose; older branches less hairy to glabrous. Leaves oddly pinnate, with to ca 15 jugae, leaf axis to ca 32 cm long, pilose; middle leaflets ca 3—9.5 cm long, ca 0.4—2.5 cm broad, lower leaflets smaller, all elliptical to lanceolate, with sharp or blunt or sometimes acuminate apex, rounded or somewhat cordate at base, lateral leaflets oblique, all more or less coriaceous to papery, on the upper side pilose to glabrous, somewhat lustrous, on the lower side tomentose, dull. Inflorescences lateral, racemose, in axils of leaves which very often have already been dropped; axis glandular hairy or hairy. Sepals to ca 4 mm long, oblong to lanceolate, outside densely pilose, glandular or not, inside sparsely appressed-hairy. Petals to ca 5 mm long, as long as the sepals or longer, elliptical to lanceolate, rounded or sharp at the top, whitish to red, membranaceous or fleshy, mostly pilose. Follicle to ca 4 cm long, to ca 1.5 cm broad, falcate, straight and beaked or curved pear-shaped (to ca 4 cm long and ca 1.5 cm broad), pilose, yellow to red. Seed with black seed coat and basal aril.

Neotype: Clemens 3805.

Distribution: See subspecies. Specimens that could not be determined as to subspecies came from Burma (Griffith 1254), Malaya (Griffith 1255) and the Botanic Gardens, Singapore (Kiah, 27-II-1926; Nur 1824).

Subsp. **palala**. — *Thysanus palala* Lour., Fl. Cochinch. 1790, 284, excl. syn. Rumph. — *Thysanus cochinchinensis* DC., Prod. 1825, 91 — *Connarus igneus* Wall. Cat. 8528, nomen — *Cnestis ramiflora* Griff. Notul. 4, 1854, 432 — *Cnestis diffusa* Blanco 1837 sensu Merrill ex parte, Philip. Journ. Sci. 4, 1909, Bot. 127.

Axis of the inflorescence glandulo-pilose or pilose. Petals membranaceous or fleshy. Fruits straight and beaked at the apex.

Neotype: Clemens 3805.

Distribution: Andaman Islands, Burma, Siam, Indo-China.

Subsp. **diffusa** (Blanco) Andreas — *Cnestis diffusa* Blanco, Fl. Filip. 1837, 386 — *C. corniculata* Blanco, l. c. 1837, 386 — *C. polyphylla* Blanco, l. c. ed. 2 (1845) 270 — *C. diffusa* Blanco 1837 sensu Merrill ex parte, Philip. Journ. Sc. 4, 1909, 127 — *Rourea rugosa* (non Planch.) F.-Vill. Nov. App. 1883, 56 — *Connarus ferrugineus* (non Jack) F.-Vill. Nov. App. 1883, 57.

Axis of inflorescence glandular. Petals membranaceous. Fruits curved pear-shaped.

Neotype: Cuming 951.

Distribution: Malay Peninsula, Philippines.

Next we may ask whether any name exists in relation with our brevipetalous species of MP, Su, Bo and C.

After Blanco's publication of *Cnestis diffusa* (1837), Griffith validly published three names in Notul. IV, viz *Cnestis ramiflora, flaminea* and *platantha* on pages 432, 433 and 434 respectively. Schellenberg considered them synonyms of *Cnestis palala*. Griffith's descriptions, however, which for a long time were the best in this genus, do show some mutual differences, at least as far as C. ramiflora and platantha are concerned; the description of his *C. flaminea* is less clear.

We may cite some sentences from the two first mentioned descriptions, namely those that relate to the mutual ratio in length of petals and sepals and of petals and filaments. From these lines we may conclude that Griffith knew aequipetalous as well as brevipetalous plants.

"*Cnestis ramiflora* Gr. ...... Cal. 5-sepalus, sepalis linearib. pubescent. Pet. totidem conforme sed latiore, patentis, apicibus incurvis ......".

"*Cnestis platantha* Gr. ...... Petala alba, lineari-oblonga paullo longiora ...... Filamenta alba, subfiliforma longiora petalis subtriplobrevissim".

This is not only strengthened by the fact that Griffith collected exactly in the area where both forms occur, viz M.P, but it has been turned almost into certainty by Griffith's own material. It comprises both aequi- and brevipetalae (Griffith 1255, 1256), so that we can admit Griffith to have distinguished between these two types.

C. flaminea being the most uncertain may be left out of consideration here. In our opinion the description of *C. ramiflora* deserves consideration for Griffith's aequipetalous material; thus the name is a later synonym of *C. palala* (Lour.) Merrill. The name *C. platantha* relates to his brevipetalous material and seems to be the correct name for the brevipetalous species now distinguished by us.

The lectotype is Griffith 1256.

2. **Cnestis platantha** Griff. Notul. 4, 1854, 434. — *Cnestis diffusa* Blanco 1837 sensu Merrill ex parte, Philip. Journ. Sci. 4, 1909, Bot. 127. — *Cnestis palala* (Lour.) Merrill ex parte, J. Str. Br. Roy. As. Soc. no. 85, 1922, 201. — *Connarus polyphyllus* Miq. Fl. Ind. Bat. Suppl. 1860, 529. — *Rourea dasyphylla* Miq. l. c. 1860, 528. — *Santalodes dasyphyllum* O. Ktze, Rev. Gen. I, 1891, 155.

Shrub, often climbing, to ca 10 m high. Young branches mostly crispately tomentose; older branches less hairy to glabrous. Leaves oddly pinnate, with up to ca 24 jugae, leaf-axis up to ca 50 cm long, pilose; middle leaflets ca 4.5—10.2 cm long, ca 1.5—2.8 cm broad, lower leaflets smaller, all oblong to lanceolate, with rounded to acute apex, rounded or somewhat cordate at base, lateral leaflets oblique, more or less coriaceous to papery, on the upper side pilose to glabrous, somewhat lustrous, on the lower side tomentose, dull. Inflorescences lateral, racemose, in the axils of leaves which very often have already been dropped; axis glandular, hairy. Sepals to ca 5 mm long, lanceolate, outside densely pilose, glandular or not, inside sparsely appressed-hairy. Petals to ca 3 mm long, shorter than the sepals, obovate to lanceolate, with round or acute apex, whitish to red, membranaceous, mostly pilose. Follicle ca 3.5—5 cm long, ca 1.3—2.2 cm broad, curved pear-shaped, pilose, yellow to red. Seed with black seed coat and basal aril.

Lectotype: Griffith 1256 (K).

Distribution: Malay Peninsula, Sumatra, Borneo, Celebes.

Uncertain synonyms: *Cnestis flaminea* Griff. Notul. IV, 1854, 433, tab. 608, fig. 2 — *Connarus foliolosus* Jack ex Wall. Cat. 1828, nr 8529, nomen.

The limitation and rank of some taxa within the genus *Cnestis* as proposed by the present writers are different from those in Schellenberg's system. Consequently our Indo-Malaysian species and subspecies cannot be arranged in accordance with his scheme (see introduction). We do not think it advisable to produce a tentative scheme on the strength of data on Indo-Malaysian *Cnestis* only. A study of the African species, however, is beyond the scope of the present investigation.

Summary.

A study has been made of the Indo-Malaysian species of *Cnestis*. The mutual length ratio of sepals and petals, — brevi- and aequipetaly —, is the main differentiating character for the species; there are no transitions. The areas of distribution overlap in the Malay Peninsula (fig. 1); brevipetalous types are known from the Malay Peninsula, Sumatra, Borneo and Celebes, aequipetalous types from Burma, Siam, Indo-China and the Andaman Islands, the Malay Peninsula and the Philippines. Fruits are of two different shapes: beaked in aequipetalae of the Andamans, Burma, Siam, and Indo-China, pear-shaped in remaining aequipetalae and in brevipetalae. Leaves tend to be longer and jugae more numerous in brevipetalae than in aequipetalae.

Other characters do not have so clear a separating value, such as texture and indumentum of leaflets, indumentum of inflorescence, texture and indumentum of petals, length of stamens, type and length of pistils, length ratio of stamens and pistils. However, even on the strength of these characters there is some reason to distinguish both groups mentioned above. As to the indumentum of petals there is a remarkable cline in a decreasing sense from the Philippines to continental Asia, the Andamans and the Malay Peninsula and back to the east through the brevipetalae of Malay Peninsula, Sumatra, Borneo and Celebes.

Brevi- and aequipetalae have been considered to represent two species, viz *Cnestis platantha* Griff. and *Cnestis palala* (Lour.) Merrill. The latter one has been divided into two subspecies, viz subsp. *palala* with beaked fruits and subsp. *diffusa* (Blanco) Andreas with pear-shaped fruits. For their area of distribution see fig. 1.

In many respects some plants of the Andamans, Burma, Siam, Indo-China (and the Malay Peninsula) are different from the remaining aequipetalae, but not in a uniform way as to the various characters. Although there are some arguments for a further taxonomic subdivision, we did not think it advisable to introduce such a division at present.

Our classification differs from the division as given by Schellenberg (1938). This was caused by the material on one hand, being more heterogeneous than Schellenberg described it, and, on the other hand, by the fact that some of the diagnostic characters used by him, in our opinion were not fit for use as such. Therefore a revision of Schellenberg's system of the genus Cnestis seems desirable.

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NOTES ON SOME MALAYSIAN CUCURBITACEAE

by

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(Flora Malesiana Foundation, Leiden)

(Issued 18. XII. 1954).

GYNOSTEMMA Bl.

Gynostemma hederifolia (Decne) Cogn. in D.C., Monogr. Phan. 3: 916, 1881. ("hederaefolia"). — *Sicyos hederifolius* Decaisne in Nouv. Ann. Mus. Hist. Nat. Paris 3: 450, 1834.

KANGEAN Island (N. of Bali): Gua Peteng, 1 m alt.; *Backer 26948* (BO), 15-III-1919, ♂, filaments connate up to the top, leaves far more densely puberulous than in the next specimen.

SEMAU Isle (S.W. of Timor) 200 m alt.: *De Voogd 2323* (A, B, BISH, BO, K, L, NY, P, SING), 19-XI-1935, with bottle-shaped swelling at foot of stem, pictured in photographs in De Trop. Natuur Jubileum-Uitg.: 71. 1936 and 29: 6. 1940, ♂, filaments connate only in the lower half, leaves sparsely puberulous, nerves more densely puberulous.

Part of the latter number was cultivated in the Botanic Gardens at Bogor (sub no XVIII. A. 45). Van Steenis made on the living flowers the following observations: "Flower light green or green-yellow, 4—4.5 mm in diam. Receptacle green, excreting a juice (honey ?). Sepals connate about half up, acute, green, margins recurved. Petals mucronulate, densely papillose. Filaments, except the top, connate into a column 1 mm long. Anthers 5, extrorsely dehiscent, pollen sulphureous."

The data on the coalescence of the filaments in this genus are not very satisfactory. Cogniaux states in his key (l. c. p. 347): "stamina 5, filamentis connatis", in the description of the genus (l. c. p. 912): "stamina 5, filamentis basi connatis, apice divergentibus", and in his description in Engler & Prantl Nat. Pfl. Fam. IV, 5: 37, 1894: "Staubfäden nur unterwärts verwachsen". But *G. pedata* and *G. simplicifolia* I found to possess filaments which are connate along their whole length, as has the specimen of Kangean, cited above. Although the Greek word "stemma" = chaplet, is neuter, Blume, the author of the genus, gives it the feminine gender.

Up to the present the species was only known from the type locality in Timor.

MELOTHRIA L.

Melothria cissybium M. Jacobs, sp. nov. — *Fig. 1—2.*

Probabiliter dioica. *Caulis* angulatus, sulcatus. *Petiolus* 0.8—1.2(—3.5) cm. *Folii* lamina simplex, oblonga ad triangularis, membranacea, 7—11 ×

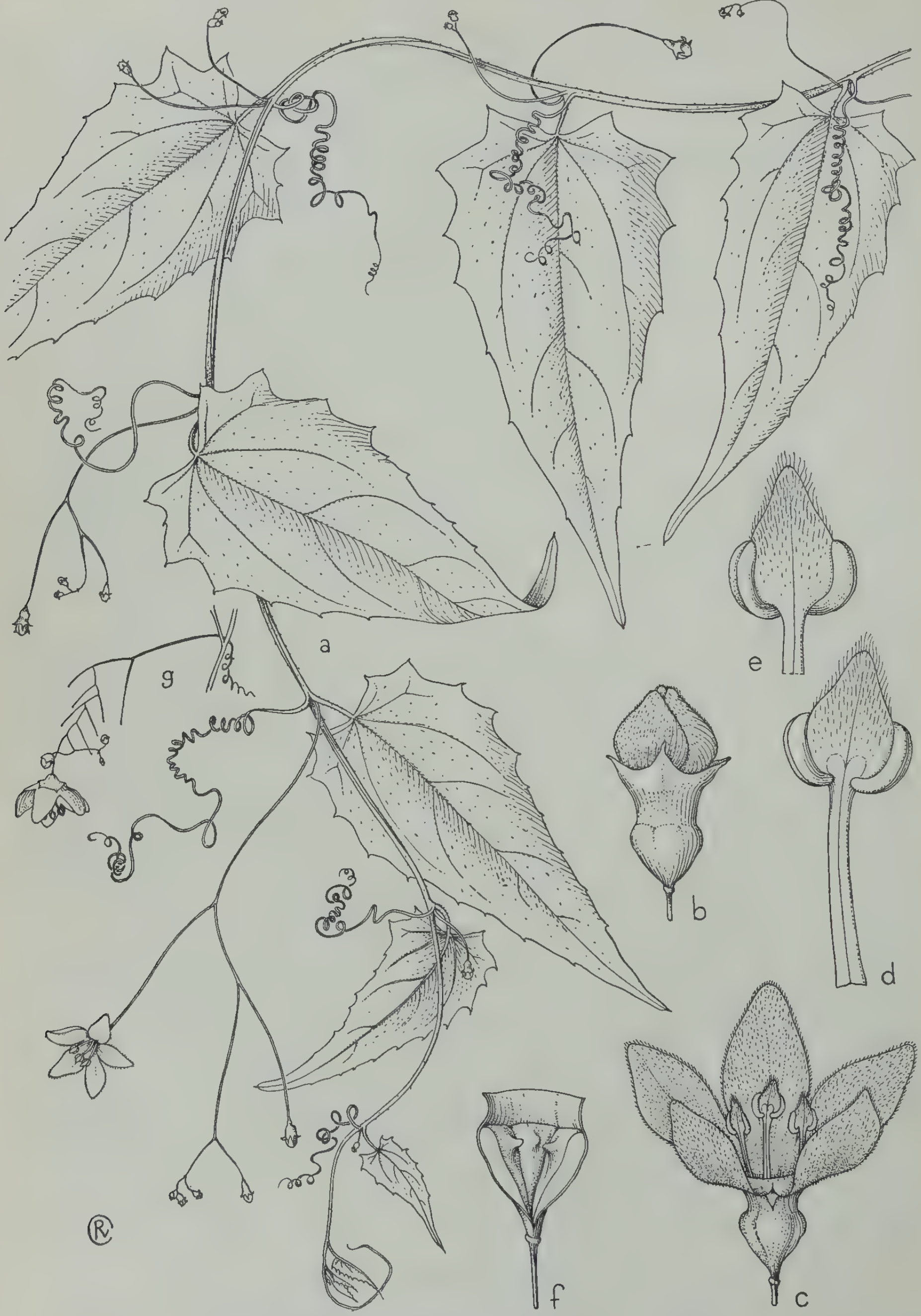

Fig. 1. *Melothria cissybium* M. Jacobs, ♂ plant. — a. Habitus, × $^{3}/_{5}$; b. flower in bud, × 2; c. flower, × 9; d. stamen, adaxial side, × 9; e. stamen, abaxial side, × 9; f. receptacle, longitudinal section, × 5; g. inflorescence, × $^{3}/_{5}$. (a—f. after Gyldenstolpe s.n.; g. after Wormersley 5543).

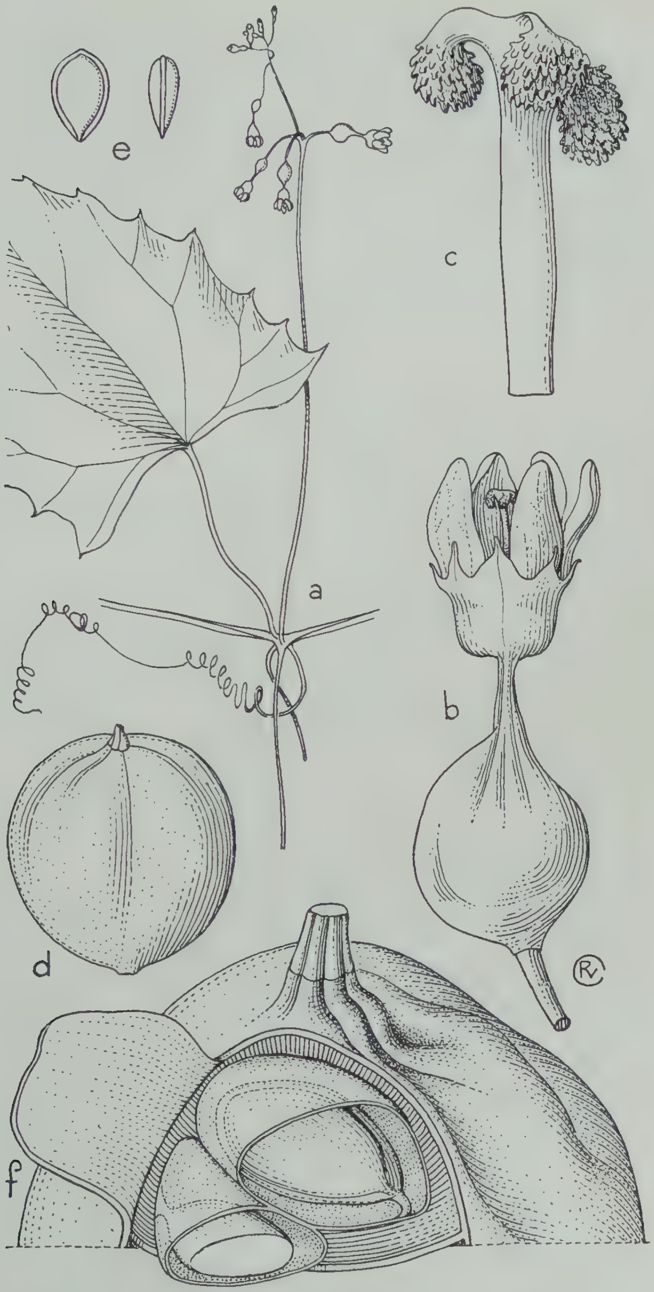

Fig. 2. *Melothria cissybium* M. Jacobs, ♀ plant. — a. Habitus, × 1; b. flower, × 7; c. style, × 20; d. fruit, × 4; e. seeds, × 4; f. section through upper part of 1 cell of the fruit, showing 2 young seeds in their membranous coat, × 12. (after Wormersley 5364).

2.5—4.5 cm, longitudo: latitudo (1.8)2.7—3.2; apice integro, acuminato, mucronulato; basi truncata usque emarginata; margine 8—10-dentato; costa nervisque primariis pilosis; superficie superiore pilis basi bulbosis. *Cirrhi* simplices; spira extra sulcata, scabra sparsimque pilosula, intra glabra et laevi. *Inflorescentia masculina* racemosa, 4—14 cm longa, bracteis minutis vel nullis. *Receptaculum* anguste infundibuliforme, 2—3 mm longum, carnosum, tripartitum, altitudine parva in utraque media parte instructum, glabrum. *Calyx* infundibuliformis usque campanulatus, 5—7 mm longus, 5—6 dentibus acuminatis et sinibus obtusis, sparsim pilosus. *Petala* elliptica 10—12 × 4—6 mm, utrimque sparsim pubescentia. *Stamina* 5 mm; filamentis glabris, thecis 2 omnibus, paulum circum connectivum et ad partem adaxialem curvatis, 1—1.2 × 0.1—0.2 mm, connectivo plano, ovato-triangulari, 1.5 × 0.8—1 mm, sparsim brevissime villoso, apice obtuso. *Pistillodium* non visum. *Inflorescentia feminina* 7—9 cm longa, pauciflora, racemosa, scapus 6—7 cm longus, pedicellis usque ad 1 cm, inferioribus confertis; bracteis nullis. *Flos* 8—9 mm longus, supra ovarium 2 mm constrictus, pars superior receptaculi cupuliformis, carnosa, 0.5 × 1—1.5 mm, glabra. *Calyx* infundibularis, 1.5 mm longus. *Petala* 3 × 1 mm, triangularia, apice acuta; perianthium ceterum ut in flore masculino. *Staminodia* filiformia, 1.5 mm, in margine apicis receptaculi inserta. *Ovarium* globosum, 3 mm crassum, minute reticulatum, glabrum, loculis 3, 1—3-ovulatis, styli teretis pars libera 2—2.5 mm longa, stigmatis 1 mm lati tripartiti lobi globosi, patentes-recurvati, papillosi. *Fructus* globosus, apice rostro minimo, ca. 8 mm crassus, indehiscens, semina elliptica, plana, marginata, laevia, 2.5 × 1.5 mm.

Apparently dioecious. *Stem* 1—1.5 mm in diam., angular, grooved, rather sparsely set with very short sometimes bulbous-based hairs to nearly glabrous. *Leaf* lamina thin, simple, oblong-triangular, 7—11 × 2.5—4.5 cm, (1.8—)2.7—3.2 times as long as broad; apex acute to acuminate, entire, mucronulate; base truncate to emarginate, margin coarsely dentate by 8—10 mucronate teeth on either side; subtriplinerved, basal nerves branched towards the margin, connected with the 2—3 pairs of upper nerves in a looping line towards the apex, midrib and main nerves puberulous, mainly on the underside; upper leaf surface rough by short subappressed bulbous-based, towards the top directed hairs. *Petiole* 0.8—1.2 (—3.5) cm long, thin, angular, more densely puberulous than the stem. *Tendrils* simple, thin, the outer side of the spiral grooved and rough by sparse very short hairs, the inner side glabrous and smooth. ♂ *Inflorescence* 4—15-flowered, axis zigzag, as the slight pedicels rather densely haired, 4—14 cm long; bracts minute or wanting. *Receptacle* 2—3 mm 2—3 mm high, funnel-shaped to subcupular, inside glabrous, fleshy, divided into 3 sectors alternating with thes tamens, each sector adaxially with a small subconical pimple midway. *Calyx* broadly obconical, subglabrous, 3—4 mm high, teeth 5—6, acuminate, separated by obtuse sinuses. *Petals* connate for $^1/_3$, elliptical with blunt apex, with 5—7 longitudinal nerves, 10—12 × 4—6 mm, on both surfaces sparsely haired. *Stamens* 5 mm long, free; filaments glabrous; anthers each with 2 free, 1-locular, curved cells, surrounding the lower half of the connective, slightly obliquely inserted adaxially at the base, 1—1.2 × 0.1—0.2 mm; connective flat, ovate, 1.5 × 0.8—1 mm, with blunt or acute top, sparsely haired on both surfaces;

pollen globular, yellow, with fine, irregular, indistinct fingerprint-like sculptures. *Pistillodium* absent. ♀ *Inflorescence* 7—10 cm long, pauciflorous, scape thin, 6—7 cm, angular, sparsely haired to glabrous; pedicels up to 1 cm, the lowest 3—5 inserted very closely to each other; bracts wanting. *Receptacle* 6.5—7.5 mm long incl. the calyx, glabrous, constricted over 2 mm above the 3—3.5 mm high ovary, above the constriction campanulate-widened, fleshy, 0.5 mm high, 1—1.5 mm wide. *Calyx* funnel-shaped, 1.5 mm long, otherwise as in the ♂ flower. *Petals* 3 × 1 mm, segments acute-triangular, otherwise as in the ♂ flower. *Staminodes* filiform, 1.5 mm long, inserted upon the margin of the fleshy disk-like apex of the receptacle. *Ovary* globular, 3 mm in diam., fine-reticulate, glabrous, 3-locular, each cell with 1—3 ovules surrounded by a membranous coat. Free part of the style terete, 2—2.5 mm long; stigma 1 mm wide, divided into 3 globose, patent to recurved, papillose lobes. *Fruit* globose, 8 mm in diam., indehiscent. *Seeds* flat, elliptic, narrow-margined, pale yellow, 2.5 × 1.5 mm, smooth.

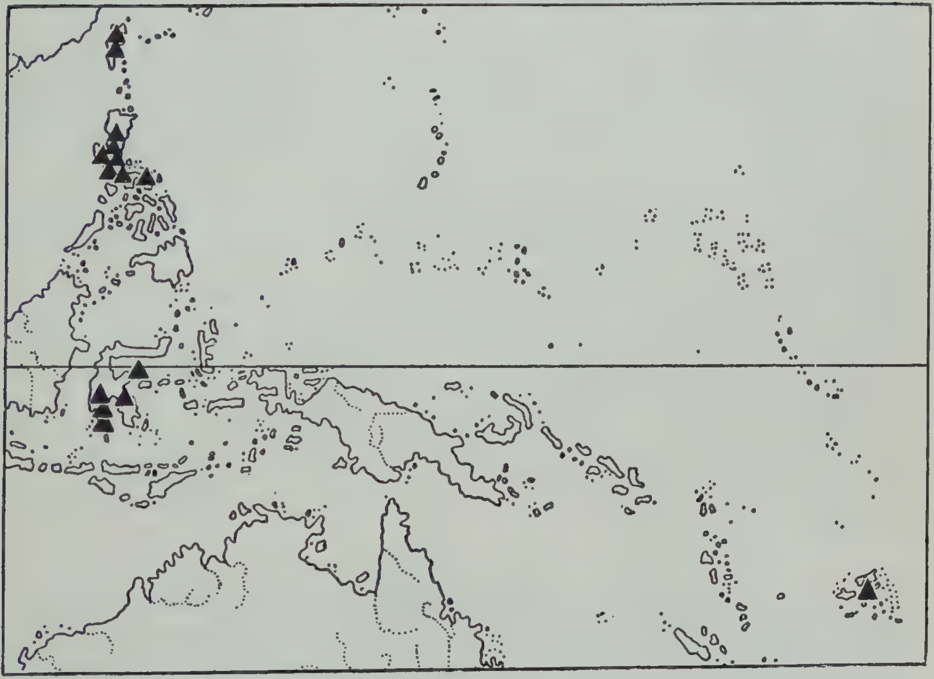

Fig. 3. Distribution of *Neoalsomitra integrifoliola* (Cogn.) Hutch.

EAST NEW GUINEA. Western Highlands: Al River, Nondugl, 2100 m alt., *Womersley, NGF 5543* (L, *holotype*; LAE, *isotype*), 7-IX-1953, ♂, climber in forest, flowers yellow; ibidem: *Womersley, NGF 5364* (L), 8-IX-1953, ♀, flowers yellow; same locality, Wahgi Mts, Weiga, 2300 m alt., *Greta Gyldenstolpe s.n.* (S), 1—3-X-1951, ♂.

The name is a transcription of the Greek word κισσυβιον., meaning wooden tub or cup for mixing and drinking, on account of the shape of the receptacle.

NEOALSOMITRA Hutch.

Neoalsomitra integrifoliola (Cogn.) Hutchinson in Ann. Bot. n. s. 6: 99, 1942. — *Gynostemma integrifoliola* Cogniaux in D. C. Monogr. Phan. 3: 916, 1881. — *G. elongatum* Merrill in Philip. Journ. Sci. 3: 267, 1908. — *Alsomitra integrifoliola* Hayata in Journ. Coll. Sci. Imp. Univ. Tokyo 30: 121, 1911; Hayata in Ic. Plant. Formos. 1: t. 38, 39, 1911; Cogniaux in Engler, Pflanzenr. 4, 275, 1: 17, 1916. — *Hemsleya elongata* (Merr.) Cogniaux in Engler, Pflanzenr. 4, 275, 1: 26, 1916. — *Alsomitra "integrifolia"* in Ind. Kew. Suppl. 5 (sphalma).

CELEBES. S.W. Peninsula, Lombasang, 950 m alt., *Bünnemeijer 11159* (BO), 25-IV-1921, flowers ♂, green; Pankadjene. *Teysmann 12432* (BO), VII—VIII-1877, ♂; Cape Alakuan, *Noerkas (Exp. van Vuuren) 277* (BO, L), 6-VI-1912, ♀ with flowers and fruits. — Central Celebes; Distr. Malili, Takarang, 500 m alt., in groves, *Kjellberg 2131* (BO), 20-VIII-1929, ♂, small liana, flowers white-yellow, stamens 5. — E. Peninsula, Poh: *Kaudern 451* (L, S), XII-1919, ♂.

Distribution: This species was hitherto only recorded from Fiji, S. Formosa, and the Philippines (*Fig. 3*). Material from extra-Malaysian localities was not available to me.

Glands at the base of the leaflets occur also in *N. clavigera* (Roem.) Hutch., a native of SE. continental Asia and also recorded from Luzon by Hutchinson l. c. p. 102; it is said to differ from *N. integrifoliola* by the longer fruit and 3-foliolate leaves.

REVIEWS.

HOLTTUM, R. E., Plant Life in Malaya, VIII + 254 pp., with frontispiece (photograph) and 51 full page plates with numerous line drawings — Longmans, Green & Co Ltd., London, New York, Toronto, Febr. 1954 — Price 18/.—.

This charming and handy book printed on excellent paper, with its numerous clear pictures of well-known Malayan plants, reminds one in many ways of Merrill's "Plant Life of the Pacific World" (MacMillan 1946, New York), which has perhaps served Prof. Holttum as an example. Its size being only slightly smaller than Merrill's book and the area covered being very considerably smaller, its descriptions of plants are naturally more detailed; the more so as only a choice has been made, in which the special interests of the author — ferns, orchids, gingers — are evident though not predominant.

The plants described are not regionally arranged. The 17 chapters are rather headed by names of life-forms, striking organs, and special habitats. As is pointed out in the Preface, the book is "intended primarily for the Malayan resident who wishes to begin a study of Malayan plants". In this purpose the book will doubtless prove to be a success: the reader is gradually taught quite a bit of botany of various fields, morphology, anatomy, ecology, hybridisation, etc. These are demonstrated at plants which are within easy reach of the ordinary layman for which it is destined. Short opening and concluding chapters deal with general features of tropical plants and with the Malayan forest. Since the author is a well-known expert and the Malayan flora as here described is a very good example of any flora between, say, Calcutta and Fiji, it may well be useful to residents of many other countries as well.

H. J. LAM.

E. H. BENEDIX, Indomalayische Cololejeuneen, Inaugural-Dissertation 1953, 88 p. and 31 plates (Fedde's Rep. Beih. 134). Akademie-Verlag Berlin. Price DM 25.—.

Cololejeunea is a tropical genus of minute, delicate and graceful leafy hepatics. Most of them are found growing on the leaves of ferns and palms. The above-mentioned thesis, based upon copious material, represents an excellent monograph of the genus in the Indo-Malayan region, i.e. Malaya and all islands of Malaysia, including the Andamans, the Philippines and New Guinea. Several specimens from India and S. China have been included, as well as some Japanese species, described by Horikawa. Fourty-one species are distinguished, of which fifteen are new to science. Most of the others represent new combinations. Five formerly described species were excluded from the genus.

The most important taxonomical changes are the following: two genera (*Hemilejeunea* Schiffner and *Leptocolea* Evans) were united with *Cololejeunea*. The genus *Leptocolea* is not even allowed the rank of subgenus or section, nor has its name been used for one of the author's subgenera, although *Leptocolea* had also been published as a subgenus before. This is nomenclatorally incorrect. Similarly, the fact that the name *Cololejeunea* has not been used for one of the subgenera is not permissible (Stockholm code, art. 32).

Once again this study proves that, generally speaking, the classical opinion concerning the taxonomical value of sexual characters in bryophytes, is not tenable. Not the generative, but the vegetative characters are important for the classification, especially with regard to the subgenera and sections. The author describes six subgenera (five are new; one had already been described as a genus) and nine sections (new?; no author's names are added!; if new, their names are not valid, since Latin diagnoses are lacking).

An important morphological discovery is that of the swelling cells at the base of the perianth in most species. In the author's opinion they play an important role in the dissemination of the spores.

A strictly dichotomous key for the identification of the species is added; the alternative characters are sharply contrasting. The Latin diagnoses of the new subgenera and species are very detailed and well-balanced, the drawings are quite excellent.

It is regrettable that many species are not accompanied by a complete description. The altitude above sea level is sometimes given in meters, sometimes in feet.

J. J. BARKMAN.

A. ENGLER's Syllabus der Pflanzenfamilien, etc. 12te Aufl. von Prof. Dr Hans Melchior und Prof. Dr Erich Werdermann I. 1954. Gebr. Borntraeger, Berlin. DM 40,—. — It is a pleasure to welcome the re-appearance of this book which, before the war, used to be a popular handbook to all who had to deal with plant taxonomy. The last pre-war edition, the 11th one (1936), consisted of one volume of 453 pages and 476 figures. The present edition is planned in two volumes, the first of which (Bacteria to Gymnosperms incl.) comprises almost as many pages (376) and 140 figures. The increasing differentiation of science generally has also found its expression in this work, in as much as no less than 9 authors have dealt with the matter which was formerly treated by one or two, though admittedly with the help of some more. Engler's "Prinzipien der systematischen Anordnung", which bore a very personal impress indeed, have been replaced by the chapter "Grundlagen und Methoden der Systematik". This chapter as well as those regarding the 16 phyla is thoroughly modernised and in spite of the editors' modest remark that on account of insufficient access to foreign literature the present edition is to be considered a mere attempt ("nur einen Versuch"), the general impression is that the result is very satisfactory. Valuable additions are "Keys" to groups inside the phyla, and bibliographies to the various chapters. All figures were newly chosen. Much attention has been given to fossil plants. Modern views regarding classification, terminology and nomenclature have been cautiously introduced. Generally speaking, the "Syllabus" has — admittedly — developed into a kind of textbook. This seems justified as long as textbooks of the calibre of Wettstein's "Handbuch" are not yet available in the German language, but it cannot be denied that this development gives the book a somewhat ambiguous character. The print is very clear, the paper is of good quality and the cloth binding attractive, and of a more gay though more easily soiling colour than the earlier editions.

H. J. LAM.

WIMMER, F. E., Campanulaceae-Lobelioideae, II. Teil. Das Pflanzenreich, Regni vegetabilis conspectus. Im Auftrage der Deutschen Akademie der Wissenschaften zu Berlin herausgegeben von A. Engler (†) und L. Diels (†), fortgesetzt von H. Stubbe und K. Noack. Redakteur R. Mansfeld. IV. 276b (107. Heft). VIII + 554 pages, 57 fig. — Akademie Verlag, Berlin, 1953.

Between 1900 and 1943 the editors of "Das Pflanzenreich" succeeded in publishing a number of 106 instalments of various size, together containing monographs of 74 families of flowering plants, 10 of which being still incomplete.

This series will now be continued by the German Academy of Sciences and the first volume published after the war is that by Dr Wimmer, Vienna, containing the second part of his extensive monograph of the *Campanulaceae-Lobelioideae* (the first part was published in 1943). It deals with the genera of Lobelioideae with capsules (Lobelieae), whereas the first part contains those with berrylike fruits (Delisseae). It supplies us with keys, detailed descriptions, lists of synonyms, literature and specimens, so well known from earlier volumes of the series.

The fact that Dr Wimmer has spent 25 years of his life on the elaboration of this monograph may be a guarantee for its thoroughness and completeness. It is regrettable that the rather coarse drawings are contrasting unfavourably with the otherwise well got-up book.

S. J. VAN OOSTSTROOM.

E. M. MARSDEN—JONES and W. B. TURRILL. British Knapweeds. A study in synthetic taxonomy. Ray Society London 1954. 201 pp. 27 plates and 3 fig. — Price 27/6.

The authors have examined the British forms of *Centaurea*, especially those in the group of *C. nigra*, *C. nemoralis* and *C. jacea*; minor attention is paid to *C. scabiosa* and *C. aspera*. This group is stated to be very complicated in Britain owing to a high fertility in crossing; perhaps, however, the situation is still somewhat less complicated than in the Netherlands and other parts of western Europe. In the British Isles *C. nigra* and *C. nemoralis* are far more common than *C. jacea*; the intermediate forms are indicated as *C. jacea* × *nigra* a.s.o., no special names being given to these forms.

The authors have done a great deal of important work on the problem as a whole, considering it not only from floristical, geographical and strictly taxonomical points of view, but also from genetical, cytological and more general ones. Their conclusions are important too for taxonomic studies in other fields of botany.

It is interesting to learn that *C. nigra* and *C. nemoralis* are considered two distinct species (with which I agree); I was, however, surprised to find that only *C. jacea* has been mentioned and no related species from the continent of western Europe; I wonder whether the latter are really no natives of the British Isles. It is one of the facts that make the situation on the continent so complicated, that nearly 95 % of all the plants have to be labeled with x-indications! It is therefore possible that the taxonomic conclusion of this work, however reasonable for the British Isles according to the authors' results, and in agreement with my own little experience there, may not satisfactorily hold on the continent, *in casu* the Netherlands. However, this does not apply, of course, to the very important scientific and synthetic considerations, expounded in this book.

J. L. VAN SOEST.

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to Vol. VII

compiled by

C. KALKMAN

(Synonyms in italics, new names in heavy type)

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